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Indexed in the Industrial Arts Index. Published every Thursday. Subscription Price North America, South America and U. S. Possessions, $8; Foreign, $15 a year. Single Copy, 35 cents.

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Cable Address, "Ironage" N. Y.

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The IRON AGE

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The Empty Chair

THERE are some four million empty chairs at the tables of American homes today; chairs which not long ago were occupied by our beloved sons and brothers. And already, though the second front is still to come and we have hardly begun to fight offensively, many of these chairs will never again be occupied.

There is a real democracy in these empty chairs. They are to be found in the homes of the rich and the poor; the employer and the laborer. But by sheer arithmetical weight of numbers, there will be far more of these permanently empty chairs in the homes of labor than in all other categories. For today we have over 54 million workers in our labor forces. And that means 64 per cent of all the men and women between the ages of 15 and 59.

Each one of us, no matter what his station in life may be, is responsible for doing everything in his power to help win this war. It is a responsibility not merely equal to that of the soldiers and sailors who are going abroad to fight for their country but one that is even greater. It is greater because they are risking their lives and in many instances will lose them. It is greater because they are subject to established discipline while we must depend on self-discipline.

Self-discipline is not an easy thing to exercise in a democracy that has been based upon individual freedom. Yet we must attain it here at home in our daily work if we hope to match the totalitarian efficiency of the Axis powers.

We have not yet achieved that self-discipline here. It we had, we would not hear of 20 per cent absenteeism in some of our war production plants.

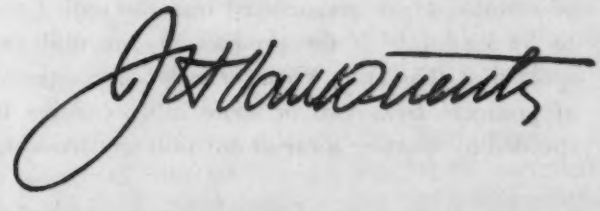
Can you imagine such things as this happening in the war production plants of the Axis powers? Can you imagine a German or a Japanese mechanic or machine operator taking a day off from work each week because he happens to feel a bit under the weather or because big wages are burning holes in his pockets?

This is not a problem that management can solve. It is a personal problem for labor. Or perhaps, in some instances, for labor unions.

The American public, of which labor is such a large part, will cheerfully do without meat or coffee or gasoline. It will buy bonds to the limit and undertake a tremendous tax burden. It will even resign itself to the drafting of our 18-year olds, most of whom seem like babies to their fathers and mothers.

But the American people have the right to expect that every man will do his duty. And at home that duty is to put in every possible working moment. It's not too much to ask in view of our established working week.

Remember, friends, an empty place at the bench or machine may mean an empty chair after this war in somebody's home, perhaps in yours.



• • • *This editorial appeared originally in the issue of Oct. 29, 1942. It is repeated for two reasons—first, because cabled copy for a current editorial had not been received from Mr. Van Deventer up to press time. Mr. Van Deventer is enroute from England to this country. And second, because slowdowns due to over-optimism give the editorial even greater significance than it had two years ago, when it was written.*

Time necessitates only two changes. "Four million empty chairs" should read "eleven million empty chairs," and "54 million workers" should read "61 million."

Round-the-Clock Carloading at Inland

Carloading and prompt dispatch of cars from the mill are important to Inland because they are important to Inland's customers. These round-the-clock jobs have been intensively studied, resulting in improved packaging and carloading despite full rolling schedules, shortage of some types of railroad equipment, scarcity of bracing, etc.

When an order is ready for shipment, cars of suitable types are ordered into the mill. Cars to be loaded with the product of one mill are spotted at that mill. When carloads are composed of products from two or more mills, loading is speeded by spotting a car at one mill and trucking the products of other mills to the car. Throughout each hour of the twenty-four, expediters keep steel flowing to loading points and as soon as cars are loaded, they are switched to the railroad yard where they are assembled for quick dispatch to our customers.

We invite you to confer with an Inland shipping specialist. He will gladly study your loading, unloading, and shipping problems, giving you all available assistance under the conditions of war, and helping you plan for speedier and more convenient delivery of steel for use in time of peace.

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The IRON AGE
November 6, 1944

NEWS FRONT

► Automobile companies are beginning to place orders for steel and parts for civilian passenger car production. Deliveries schedules have been set up by weeks following Go-Day. Some shipments will be made two weeks after Go-Day, which presumably will be shortly after the defeat of Germany.

Between the automobile, stove and refrigerator manufacturers about half a million dollars worth of business has been placed. One company in placing these orders for steel and parts has specified that prices will be the same as those charged to other manufacturers for the same quality and quantity.

► An odd aspect of the Japanese war is that there are no known Jap air aces. Perhaps there are no aces. Despite many propaganda broadcasts from Tokyo, no Jap pilots are known by name to Americans fighting in the Pacific.

► The British Government will have about a thousand factories to turn over to industry after the war. Like the American plan, disposal of many of these plants is now being arranged without regard as to exact time the properties will be available. Unlike the American plan, the British procedure involves ten-year leases with no outright sales.

► Government crutches to business in England after the war will be far more pronounced than in this country. A council has been set up to help industry on design problems, and another is being formed to keep a constant check on retail distribution variables.

► Two furnaces of an unusual design have been in use in England for sufficient time as to promise notable fuel savings. Instead of the products of combustion being withdrawn through a flue, the furnace gases are withdrawn through permeable wall refractories.

► Preliminary sparring to nail down export outlets continues to occupy much of the attention of various groups in England and the U. S. Great Britain is now exporting to the amount of a billion and a quarter dollars as compared with three billions for the U. S., exclusive of lend-lease.

Thus: Great Britain is doing a larger commercial export business today than the U. S., based on a per capita basis. But, even though many American exporters think they are being stung, the British business man is equally convinced he is getting the worst of it.

► The drafting of British civilians to work in coal mines has its difficulties. An 18-year old boy was sentenced to two months' imprisonment for refusing to go into the pits, and expressed preference for the prison sentence. But, after a quick visit to the prison he changed his mind and went to the mines.

► The Russians are not limiting their machine tool purchases to new equipment but are now going through midwestern plants, looking at pieces already installed but not in very much demand and buying them for immediate shipment to the U.S.S.R.

► The extra of $5 a ton on medium gages of aluminum killed steel, now well established in Detroit, will probably result in considerable haggling when passenger car production is resumed. Automobile companies will take the position that in prewar days such an extra was never charged, that mills should be able to deliver deep-drawing sheets of the same quality as prewar, and that after all there is no way of their being able to tell whether they are getting aluminum killed steel or simply ordinary low carbon deep drawing sheet.

The steel companies can counter that the residual alloys likely to be present in steel for some time after the war make stabilizing of the metal an absolute necessity if breakage in deep drawing is not to rise to prohibitive levels. In this they will have practical proof to back them up because purchasers of non-stabilized steel may find breakage in unprecedented proportion.

► The War Department has announced that battlefield scrap iron and steel will no longer be returned from overseas theaters because of the improved domestic supply and because the considerable labor involved has resulted in some cases in delays in shipping time.

. . . Equipment and Material for

A YEAR or two ago when industrial firms first began to make use of the precision technique ("lost wax") process for ferrous and non-ferrous metals, they often had to devise their own equipment because existing apparatus had been developed primarily to serve the manufacturers of jewelry and dentures who had been using the process for years. Within recent months, however, a great deal of casting equipment especially designed for industrial applications has been placed on the market. Some of the centrifugal casting machines represent adaptations of dental machines which have been greatly increased in size and capacity and have been motorized. The original dental units were spun by spring motors such as are used in phonographs.

What is perhaps even more significant is that industrial equipment makers totally unknown to the jewelry and dental trade have appeared in the picture. Among them are manufacturers of induction heating apparatus. Melting small batches of metals in crucibles was a "natural" for induction heating because of its speed and cleanliness. Several companies in this field supply not only the crucibles, inductor coils and generators but the centrifugal casting machines as well.

At the other extreme, at least one maker of large centrifugal casting machines for general foundry work has brought out a smaller unit for precision casting in heated refractory molds.

The readers of THE IRON AGE may refer to the case histories of two manufacturers who designed much of their own equipment, in the articles—"Precision Castings of Turbosupercharger Buckets," issue of Feb. 10, 1944, and "Industrial Precision Casting by a Manufacturing Jeweler," issue of Sept. 7.

With the equipment about to be described metal parts weighing from ounces to 10 lb. or more are being cast to shape within a few thousandths of an inch of size, the tolerance depending on the size of the pieces. Before describing and illustrating the available equipment for this application, it will be well to review the process itself.

Casting Procedure

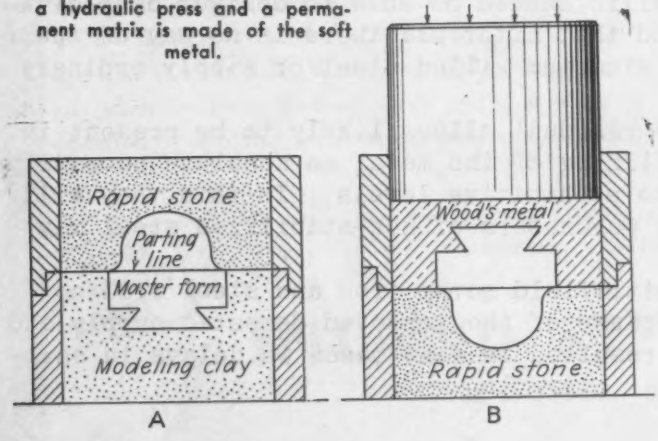
Essentially the precision casting entails first the reproduction of the piece in wax, which is accomplished by injecting melted wax into a mold made either of soft metal or steel having a cavity of the exact dimensions as the piece. If a steel mold is used large runs of wax patterns can be made with a higher degree of accuracy than is possible with soft metals.

Each wax pattern is then utilized to create a cavity in a refractory molding material called the investment. After the patterns are sprayed with what amounts to a facing sand, the procedure is to pour the investment mix over the wax patterns attached to a central gate of wax. In some set-ups the gate is set onto a rubber base, called a sprue holder, having an annular ring for holding a flask made of heat resistant alloy steel. After the investment has hardened it will have encased the wax patterns intimately without compression or distortion. The rubber base is then removed. Elimination of the wax without residue is accomplished by placing the flask in a cold oven and heating gradually to 1300 deg. F. or over so as to vaporize it, or inverting the mold over a steam table and thereby melting the wax out.

After the molds are cooled down to a lower temperature proper for casting the particular metal, they are placed in a centrifugal casting machine which sends the molten metal into the cavity originally occupied by the wax. It should be noted, however, that since the molds are poured at a temperature roughly two-thirds that of the melting point of the alloy, the flasks are sometimes *raised* to a temperature as high as 1600 deg. F. in the case of non-ferrous, refractory alloys like Vitallium metal, almost universally used for turbosupercharger buckets.

The castings are separated from

FIG. 1—Making a soft metal mold, using Kerr "Rapid Stone". At the left, Rapid Stone is poured above modeling clay matrix retaining the master part; at right, mold is inverted and the collar with plunger are placed in a hydraulic press and a permanent matrix is made of the soft metal.



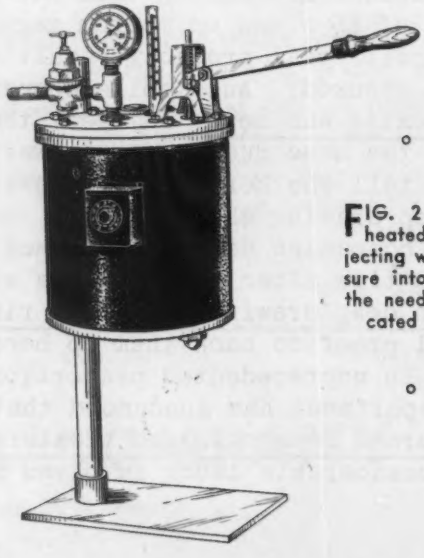


FIG. 2 — Electrically heated machine for injecting wax under air pressure into a mold, through the needle valve nozzle located on lower plate.

Precision Casting

By J. ALBIN

. . . Products offered by manufacturers—among others—that have typical uses in precision casting by the "lost wax" process are described in the first of a two-part article, which contains a great deal of hitherto unpublished data on details of the technique.

the investment by dipping in water or by steam pressure after stripping the flasks. When the procedures are properly controlled, the castings come out with sharp edges, good surface and high accuracy.

To reproduce the wax patterns or models in large quantities and having the dimensional accuracy for precision work, the steel mold is the best answer, although soft metal molds are still being used on some of the largest production jobs. In the experience of one casting firm, as many as 60,000 wax patterns can be made before signs of wear are apparent in the steel mold. Steel molds will withstand higher pressures that may be used to inject the wax, especially in the case of a hydraulic machine. Because the steel sectional mold makes demands on the greatest ingenuity and skills of the toolmaker, the bottlenecks in casting production are often located here.

Soft Metal Molds

The soft metal molds suffers an amount of distortion after repeated injections of wax. But its construction is fairly simple compared to that of a steel mold, and also certain practices help in overcoming the distortion to a degree. The customary practice is to make a mold of the master part in two pieces of soft metal, which becomes the die into which the wax is forced. Soft metal molds are generally made by the hobbing process which has been used for over 20 years in the manufacture of plastic molding dies. In producing the latter, the hob is made of tool steel to the dimensions of the part to be molded and is hardened. The hob is then mounted on the upper platen of a press and forced into the soft steel die blank which is held in a frame or chase. Hobbing of soft metal (bismuth alloy, Woods metal, Cerrobend, Cerrobase, type metal, etc.) dies is similar in that the master piece becomes the hob and is forced into the metal to the parting line. Where the end product is circular, the master may be turned in a lathe and polished. It is then sunk to its center line to form each half of the wax mold.

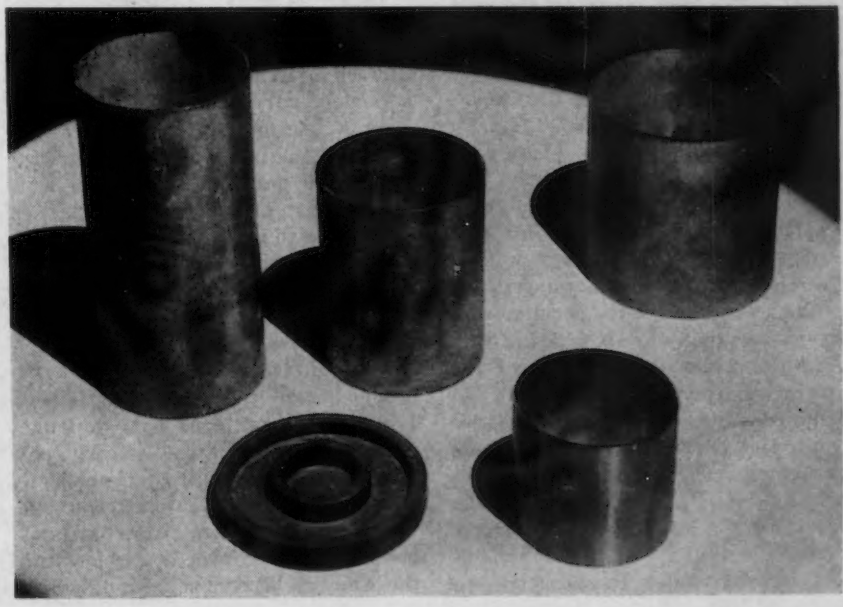
The Kerr Dental Co., 6081 12th Street, Detroit 8, employs a technique for making soft metal molds that is based on the use of its "Rapid Stone" or similar artificial stone. Through the use of Rapid Stone as a temporary holder, the scratching of the master part is overcome, a hazard which is liable to occur in the process of making the soft metal mold directly by the hobbing process. Accordingly, the bottom half of the part is put in ordinary modeling clay or a pliable wax which can be easily leveled off and scraped clean without scratching the surface of the part. The part and modeling clay base are placed in a circular frame or collar serving as a chamber for the pouring, see Fig. 1. Rapid Stone is then poured into frame.

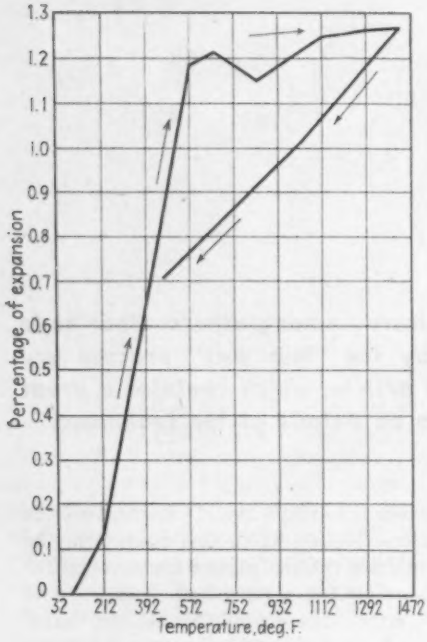
This product is like plaster, but much smoother and harder. A soft paste is formed by mixing 100 grams with 35 c.c. of water. It is put in a vacuum chamber to remove air; vibration hastens the elimination of the air bubbles. After this operation, the mixture retains proper consistency for pouring for a period of 7 min.

After the Rapid Stone has hardened (in 20 or 30 min.) the combination is inverted and the modeling clay is removed. The chamber, composed of the collar wall and the hardened Rapid Stone with the imbedded part, is now filled with a low fusing metal. Immediately a preheated plunger is placed over the metal, hydraulic pressure of about 10,000 lb. per sq. in. is applied. When the metal has hardened, it is ejected from the frame and a mold has been formed of one half of the part. The foregoing steps are repeated to accomplish the other half of the mold, except this time the Rapid Stone is removed and the first half serves as a base for the second pour.

Before pouring the second section,

FIG. 3—Flasks for retaining molding material or "investment" and wax patterns. Diameters of flasks shown vary from 3 to 5 in. Soft rubber sprue holder at lower left is used to hold wax models mounted on central gate or sprue.



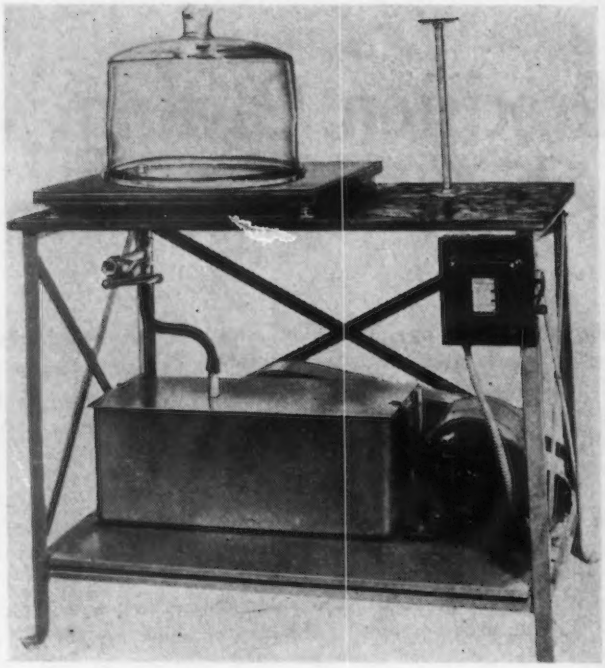


LEFT

FIG. 4 — Thermal expansion and shrinkage curve of the investment material, Cristobalite.

RIGHT

FIG. 5—Vacuum pump with table and bell jar for removing air bubbles from the poured investment. Note the spring support of the table for imparting vibration.



indented identification marks are placed on the first half of the mold and land surfaces are thoroughly cleaned with an emery cloth. The master pattern is left in place during this cleaning process and the surfaces are worked down to the parting line. It is also advisable to indicate numerically, on the outside surface of the side wall of the first section, the distance from top to bottom. Otherwise, after the second section of the mold is poured, it will be difficult to locate the parting line. Separation of the surfaces is obtained by using powdered graphite as a parting medium. Plugs of machined steel or brass are inserted in undercuts, holes, etc., or, when necessary, undercuts are blocked off by covering them with Rapid Stone. When more than a two-piece mold is indicated, additional sections are made in the same manner.

Pattern Waxes

Much research has gone into the development of the wax that is used for making a pattern or model of the item to be cast. Because it is essential that the wax possess definite characteristics, the correct pattern wax has been developed as a blend out of a number of commercially available waxes, each of which contributes its peculiar usefulness. As many as six types of wax go into the blending of some of the pattern waxes now available.

One of the essential characteristics required of the wax is that it can be evaporated from the investment without any residue. When the flasks containing the investment and correct pattern wax are heated to a temperature of 1300 deg. F. and above, no carbon deposit should remain. The presence of such deposit might, of course, contaminate certain metals. The wax, next, must possess low shrinkage upon solidification. It must have sufficient tensile strength and hardness of surface to withstand bench handling without breaking or chipping. The rate of solidification is important. If it hardens too rapidly, the pattern might break on removing from the mold. Hence, the wax must be of the kind that chills uniformly. Waxes now developed hardly cause erosive wear of the steel mold. In the experience of one fabricator, signs of wear in the steel mold began to show only after as many as 60,000 patterns had been formed.

The Kerr Dental Mfg. Co., Detroit 8, supplies two pattern waxes. The dark green Kerr "Precision Pattern Wax" may be injected into the mold at lower temperatures than usual. The correct injecting temperature for this wax may vary from 145 deg. to 170 deg. F. depending on the bulk or shape of the pattern. When forming small thin patterns which chill more rapidly than large thick patterns, it is preferable to raise the temperature of the wax. This higher temperature will assure a complete fill-in with very thin patterns, and since these small patterns have a shorter chilling time, they should be removed from the molds sooner than the heavier patterns. Large, thick patterns have a longer chilling time than the smaller patterns; hence the chilling time should be extended for such patterns and, for the same reason, patterns should not be removed from the molds until the wax has become set throughout.

The Kerr light green "Modifying" pattern wax is used to harden or reduce the chilling time of the precision pattern wax. Both waxes blend without any difficulty, and mixing is recommended to fit particular requirements.

Although it is always preferable to invest the wax patterns as soon as possible after they are produced, they may be stored provided low room temperatures are avoided. Storage temperatures between 70 and 85 deg. F. are recommended.

To aid in having the wax reach all surfaces and crevices in metal molds, Kerr Debubbilizer serves as a lubricant. It is sprayed or brushed on the mold and then blown dry. Pure, colorless castor oil, diluted with alcohol, using 50 per cent of each, can also be used. Best results are obtained by using the lubricant sparingly.

For making sprues and for similar purposes where a soft, sticky wax is needed, Kerr's "Utility" wax is available.

Zophar Mills, Inc., 112—26th Street, Brooklyn 32, supply a molding wax, C101, which was originally developed to satisfy the requirements of jewelry ring manufacturers, but is now finding use by industrial precision casting firms making components for ordnance and aviation equipment. In combination with blending waxes, this material contains carnauba wax, which supplies the hardness factor, especially important for casting objects having fine detail such as the prongs of rings. In common with other industrial casting waxes, Zophar's C101 wax is characterized by low shrinkage, the extent of which is

brought out by the fact that it is necessary to lubricate the metal mold with a light oil in order to remove the wax pattern without bending or distortion.

The American Cyanamid and Chemical Co., 30 Rockefeller Plaza, New York, manufacture four types of casting waxes, each type being subject to modification depending on the requirements of the particular mold being employed.

Type I wax is of a plastic nature to allow for carving corrections such as burrs, or where necessary, to include a conformation or detail not possible to incorporate in the mold. Type II wax possesses a hardness and flexibility for producing good definition of outline and for withstanding ordinary handling. Type III is extremely hard, yet flexible. It does not deform or fracture if subjected to severe handling or impacts. Type IV wax is suitable for large castings where volume involves the cost factor. Compared to Type III, it is a relatively low cost wax. All these waxes possess a broad period of thermoplasticity so that they may be injected with a minimum of shrinkage.

In the application where the molten wax is poured, the Cyanamid Company supplies a special waxing having a very low coefficient of contraction. For gating or mounting wax patterns, No. 338EX, a very soft and adhesive wax is available. Where desired, waxes are color coded in order that they can be readily distinguished for the particular application.

A machine, Fig. 2, especially designed to inject melted wax into metal molds is manufactured by A. H. Waage Electric Co., New York, and is distributed by Alexander Saunders & Co., 95 Bedford Street, New York. In the top plate is located the valve lever which controls the needle valve nozzle at the bottom, a mercury thermometer with a scale from 0-300 deg. F., and a compressed air regulator and gage. A temperature regulating dial is found on the thermostat on the side wall, by means of which the wax may be maintained at a constant temperature. The maximum air pressure is 90 lb., but the model can be equipped for greater pressure if desired when larger and bulkier pieces are to be cast. The standard machine has a capacity of 2 qt. There are two models, one for use on a.c. circuits and the other on d.c., both at 110-125 volts, 1250 watts. Alexander Saunders & Co. is also distributor for Waage electric storage melting pots with capacities from 1 pt. to 30 gal.

In centrifugal casting, the patterns are mounted at angles about a central rod or riser of sticky wax to obtain the optimum metal distribution. This rod, which forms a central gate for the casting, is set into a rubber base or sprue holder. Plasticine, or similar molding material, is then used to seal the crack between the outer wall of the flask and the sprue holder to prevent leakage of the poured investment. Typical flasks and sprue holder are shown in Fig. 3.

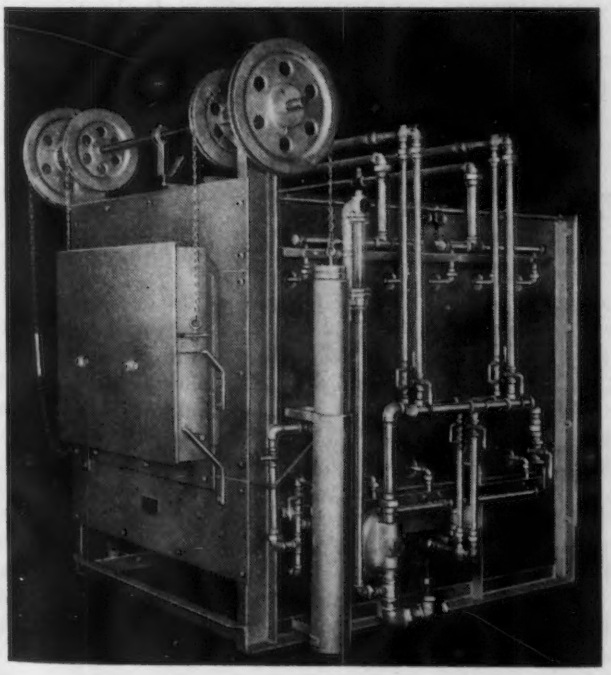
As a refractory material in this technique the "investment" or molding sand should possess the kind of properties that will lead to the production of smooth and accurate castings. It should be readily removable from the casting, and contain no corrosive or acid producing ingredients which are detrimental to the castings, the flask or the furnaces. Likewise, after the investment has been poured around the wax patterns and has solidified, no distortion or compression of the patterns should occur.

Non-Ferrous Investment

An investment material suitable for non-ferrous metals is Cristobalite which is prepared by the Kerr Dental Mfg. Co., Detroit, from a siliceous mineral of the same name. A special characteristic of Cristobalite is the achievement of a high thermal expansion in a relatively thin mix which will not crack. This thermal expansion is higher than that of quartz. In the thermal expansion and shrinkage curve, Fig. 4, the rapid expansion during the early stage of heating is evident.

The wax patterns can be set very closely to each other without any danger of the Cristobalite investment breaking down between them when the casting is made. It is important, however, that a sufficient thickness of investment is left at the end of the flask. This thickness should normally be about ½ in., but should be increased when relatively large bulks of metal are cast (anything above 5 oz.).

In order to break the surface ten-



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LEFT

FIG. 6—Oven furnace for completely evaporating the wax from the investment. The above furnace is usually supplied with a metallic hearth. The flasks are charged on trays which are then slid in and out of the furnace.

Photograph courtesy of American Gas Furnace Co., Elizabeth, N. J.

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RIGHT

FIG. 7—Pot furnace for melting non-ferrous metals.

Photograph courtesy of American Gas Furnace Co.

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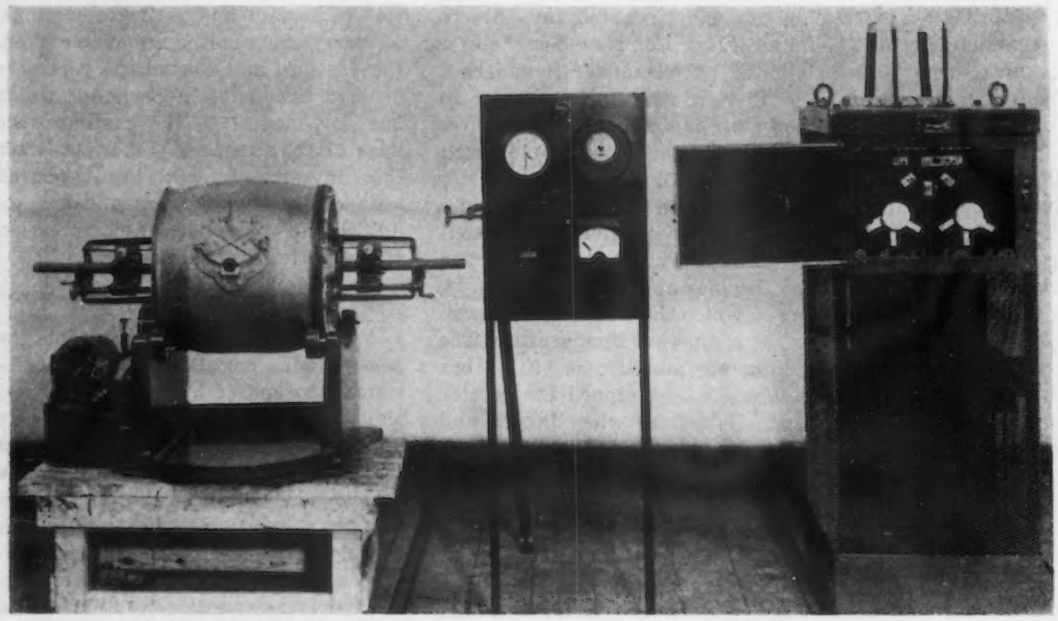

FIG. 8—Detroit rocking electric furnace, type GMS, showing panel and transformer with external tap changers. Capacity 60 lb.

Photograph courtesy of Kuhlman Electric Co., Bay City, Mich.

sion of the wax so that the investment can flow freely on the surface of the pattern, the mounted patterns should be cleaned prior to investing. The Kerr Dental Mfg. Co. provides a product known as Debubbilizer for this purpose. The patterns after they are mounted on the sprue holder are simply immersed for an instant. The excess solution is gently shaken off.

The proportion of water to Cristobalite is not critical. A thinner mix (50 c.c. of water to 100 grams of Cristobalite) is ideal for casting pieces with fine detail, particularly when the vacuum pump is employed to draw the air from the investment. A heavier mix (44 c.c. of water to 100 grams of Cristobalite) is recommended for bulkier pieces. For thorough and fast mixing of the Cristobalite with water, some firms make use of a mixer similar to a baker's mixer.

An interesting practice in connection with the pouring of the investment is the use of a 1/16 in. asbestos lining within the flask, which serves as a cushion for the expansion of the investment during its setting and heating phase. The liner generally is cut off about ¼ in. short of each end to allow the investment to seal securely.

For the purpose of investing, a vacuum pump is recommended to draw out the absorbed air. The mixture of Cristobalite and water should be vacuumed first while in the mixing bowl and also immediately after the investment has been poured into the flasks, completely covering the wax patterns. The application of vibration to the mixing bowl and the flasks during the vacuuming will hasten elimination of air from the mix. The Cristobalite should be allowed to stand for at least 1 hr. before placing the flash into the furnace. Once the wax patterns have been invested, the flask may stand indefinitely before burning out.

The length of time for burning out the wax will vary with the size of the flask. Starting with a low heat and gradually increasing until a temperature of 1300 to 1350 deg. F. is reached, the flask should be held at this temperature until the wax is vaporized (carbonized) and the heat is uniform throughout the flask.

To obtain dense castings it is essential to allow the flasks to cool before casting. The cooling should be gradual and at a rate approximating the heating rate. The proper temperature of the flask for casting is dependent upon two factors, the metal used and the bulkiness of the pieces to be cast.

First, the temperature of the flask is relative to the melting temperature of the metal. For example, if the metal used melts at a temperature between 1700 and 1800 deg. F., a flask temperature from between 800 and 900 deg. F. is recommended. The second factor that determines the temperature of the flask is the bulk of the castings involved. As the castings become progressively heavier the flask temperature should be lowered. In extremely heavy pieces the flask temperature should be lowered to between 500 and 600 deg. F. The flasks may be cooled as recommended without any danger of the Cristobalite cracking.

If the metal used permits plunging of the flask while hot into water, removal of the investment from the flask is facilitated. Brushing and exposure to steam pressure is an efficient means for removing the investment from the castings.

High Temperature Investment

For casting stainless steel, Haynes Stellite, Vitallium and other alloys having high melting points, a special heat resisting investment is required. In place of the usual investing material containing an amount of plaster of paris which breaks down under high temperatures, an investment containing siliceous powders together with a *binder* known as ethyl silicate can be used.

Ethyl silicate, Si (OC_2H_5), is a product of the Carbide & Carbon Chemicals Corp., 30 E. 42nd Street, New York 17. As an ester it is slowly hydrolized by water to water and silicic acid which in turn dehydrates to an adhesive form of silica.

The properties of pure ethyl silicate is given below; the commercial product, condensed ethyl silicate, is distinguished by a brown tint but its properties are practically the same as the pure product.

Specific gravity at 20/20 deg. C. — 0.933 to 0.938; boiling range (760 mm.) — below 160 deg. C. not more than 5 per cent; below 170 deg. C. not less than 95 per cent; available silica as SiO_2 — 28.8; acidity as (HCl) — not more than 0.05 per cent; color, water white; odor, mild, non-residual; average weight at 20 deg. C., 7.78 lb. per gal.

Before mixing with the siliceous powders, a preliminary solution of the ethyl silicate needs to be made as follows:

Mix 50 volumes of silicate with 1 volume of water and 30 volumes of denatured alcohol (or a synthetic solvent such as Synasol). At least 24 hr. must elapse before this preparatory solution is ready for modification. This is done by mixing 9 volumes of the solution with 1 volume of water and a little hydrochloric acid giving a completely hydrolyzed solution that is ready for use.

The preliminary or partially hydrolyzed solution may be stored for an indefinite period and the completely hydrolyzed material for at least a month without the occurrence of a change in viscosity or deposition of silica. Deposition of silica occurs on evaporation of the water and solvent. To get consistent results the time elapsed between the preparation and use should always be the same.

It may be noted that the hydrolysis of the silicate solutions are hastened by the addition of minute quantities of a mineral acid such as hydrochloric acid. The speed of the reaction will depend on the quantity of acid added and can thus be varied to meet particular needs of viscosity or speed of setting.

The solvent, Synasol, is also a product of Carbide & Carbon Chemicals Corp., and consists of 100 parts of 190-proof alcohol (denatured), 5 parts of ethyl acetate and 1 part of aviation gasoline.

The approximate price of condensed ethyl silicate is 55c. per lb., f.o.b. South Charleston, W. Va. The pure variety sells for 70c. per lb.

Kerr Dental Mfg. Co., Detroit, is preparing a water setting investment which will be suitable for ferrous use and other metals of high melting point.

Vacuuming the Investments

During the mixing of the investing material and water, an amount of air is entrapped in the mixture. Unless this air is removed before the investment solidifies about the investment—and the time element is important because of fast hardening in the case of the investment used for non-ferrous casting, such as Cristobalite—the casting may lack a smooth surface. Tiny excrescences will cover the casting due to the impingement of air bubbles about the wax. The vacuum method for removing the air is recommended in two steps. First, after the investment material has been mixed with water, the mixture is poured from the mixing bowl into jars of convenient size and placed under a bell jar. Vacuuming is repeated immediately after the investment is poured into the flasks containing the wax patterns.

A unit developed for quickly eliminating air entrapped in investments is distributed by Alexander Saunders & Co., 95 Bedford Street, New York 14, and is illustrated in Fig. 5. An oil sealed vacuum pump having a free air capacity of 12 cu. ft. per min. attains a barometric pressure equal to 29 in. mercury. A rubber mat is cemented to a steel plate measuring 22 x 22 in. The inside dimensions of the bell jar are 16 in. diameter and 11 in. in height. The pump is powered by a 1 hp., 3 phase, 220 volt, 60 cycle motor. A smaller unit is also available for experimental use, which is operated by a ¼ hp. motor and employs an 8 x 5 in. bell jar.

Heating the Investments

Heating the flasks containing the investments for the purpose of evaporating the wax and bringing them to the appropriate casting temperature is generally accomplished in a conventional batch type oven furnace.

These ovens are heavily insulated with high grade modern insulation firebrick and have special hearth materials which promote a quick heat up

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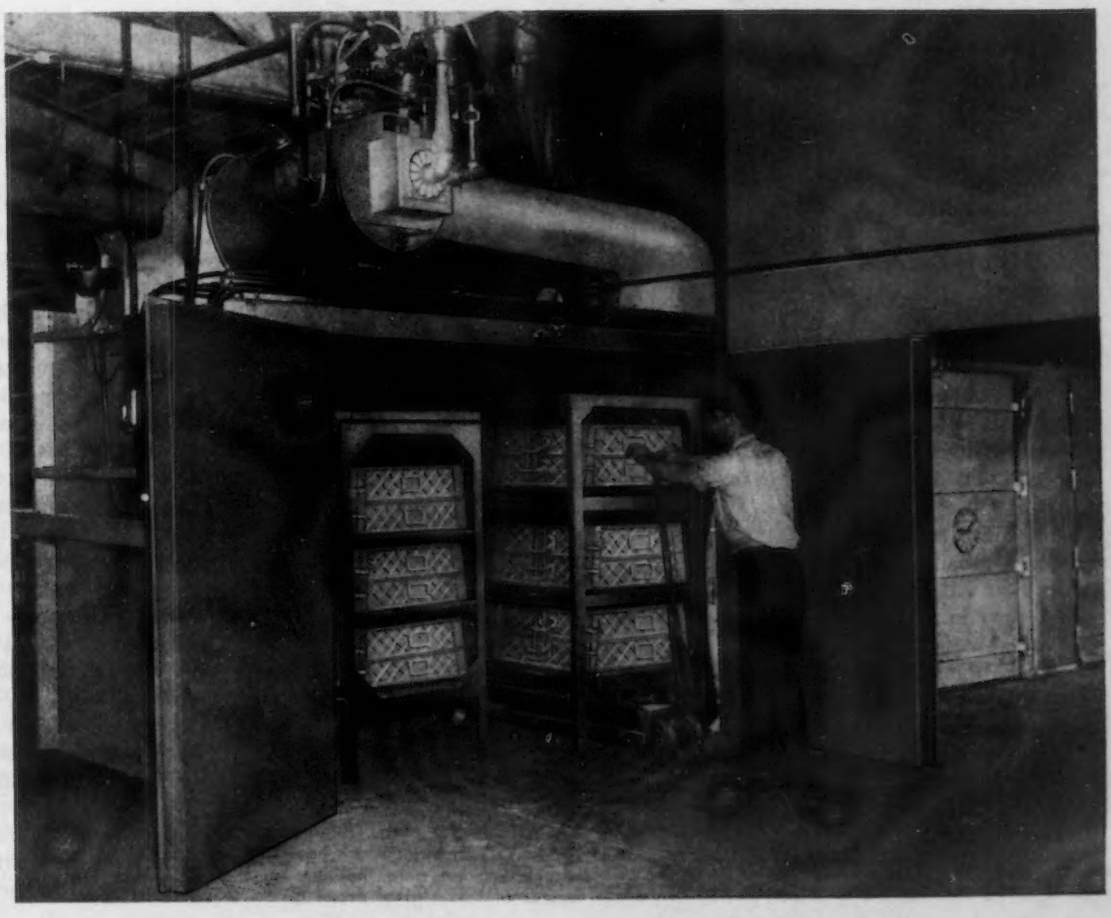

FIG. 6A—Industrial type drying oven for eliminating moisture from large size flasks. Forced air circulation with external heater employed for rapid heat transfer and uniformity. Flasks have been put on racks which are being placed into the oven by a lift truck. *Courtesy Despatch Oven Co., Minneapolis.*

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to 1400 deg. F. in about 15 min. and 2000 deg. F. in about 50 in.

To shield the operator from the hot brick facing, a heavily insulated, counter-balanced slide or pivoted door is desirable, embodying a tight seal and providing evenness of heating. One type oven furnace for heating investments is shown in Fig. 6.

Pyrometers and automatic temperature regulators are essential for precise control. Since the casting temperature for the same metal varies according to the bulkiness of the castings, a pyrometer controlled arrangement of ovens permits accurate control of the heating cycles for batches of flasks.

In contrast to the batch type oven, there is the conveyor type oven utilized by the Austenal Laboratories, Inc., and described in the article "Precision Castings of Turbosupercharger Buckets," THE IRON AGE issue of Feb. 10, 1944.

In order to speed up elimination of excess moisture before the flasks are placed in the oven furnace for vaporizing the wax, a special drying oven can be used to advantage when larger flasks (5 in. or more in diameter) are used. Temperature should be maintained at about 140 deg. F. to prevent generation of steam which may cause flaking or cracking of the investment. These ovens should recirculate the air in order to achieve fast drying and uniformity of temperature throughout (see Fig. 6A).

In order to speed up elimination of excess moisture before the flasks are placed in the oven furnace for vaporizing the wax, a special drying oven can be used to advantage when flasks of 5 in. or more in diameter are used. Temperature should be maintained at 140 deg. F. to prevent generation of steam which may cause flaking or cracking of the investment. These ovens should recirculate the air in order to achieve rapid heat transfer and uniformity of temperature throughout.

Melting the Metal

A large number of industrial furnace manufacturers supply melters that are finding application in the typical precision casting plant. It should therefore be sufficient to indicate the general types of pot furnaces and electric arc furnaces. The induction heating furnace, on the other hand, is a more recent facet of metal melting in this technique. It is of especial interest because of the greater speed and higher temperature attainable. Furthermore, the application of heat through the agency of an easily movable tubular coil permits compactness. Doubtless, the design of an integral induction furnace and centrifugal machine is a goal of some equipment manufacturers.

For melting aluminum, copper, brass alloy, zinc, tin, lead and cast iron (but not recommended for steel), the gas or oil fired pot furnace is generally satisfactory. Illustrated in Fig. 7 is a small gas fired furnace which will take a No. 10 crucible capable of pouring approximately 30 lb. of metal. This furnace has a swinging cover lifting assembly.

Better adapted for melting steel (and non-ferrous metals as well) is the electric arc furnace, such as the furnace illustrated in Fig. 8, which has a capacity of 60 lb. The transformer for this furnace is connected to a 220 or 440 volt power line and requires 50 kva. single phase capacity. A smaller arc furnace of 10 lb. capacity is also provided by this manufacturer.

This article will be concluded next week with a description of induction heating furnaces and centrifugal casting machines.

Drawings Printed on Metal With Layout Paint

MATERIALS for a simplified method of printing working drawings directly on metal have recently been announced by the Eastman Kodak Company. These are Kodak layout paint and Kodak layout paint primer. As the name of the latter implies, it acts as a subbing base for the layout paint. The new method is said to be of widespread applicability for the production of products involving flat metal parts.

Kodak layout paint is sprayed in ordinary room light directly on virtually any primed metal surface with a conventional spray gun, after the surface has been cleaned reasonably free of loose dirt and grease. Drying takes place rapidly and the prepared metal is ready for immediate use or it can be safely stored for a reasonable time in a dark place.

The drawing which has been previously prepared with black ink on a transparent or translucent material is next laid in contact with the prepared surface and an exposure of a few minutes' duration made to arc or mercury vapor lights. The drawing is removed and the metal flooded with warm, weak ammonia water. A vigorous spray of tap water follows which washes away the entire exposed coating, leaving only white lines where black lines appeared in the drawing. Another thin spray coat of layout paint primer protects the finished product.

A GENTLE water spray removes all Kodak layout paint which has been light-struck, leaving only the lines and figures of the original drawing.

According to Kodak, parts so marked are as accurate as the original drawing. On metal, the new layout paint withstands bending, shearing and punching without showing any tendency to loosen, and will actually resist the application of a cutting torch up to the point where the molten metal carries it away, provided that the metal does not scale.

The new method is said to have a distinct advantage over the scribing method because operators' instructions which are inked on the drawing are transferred to the part to be fabricated. Reductions in scrap loss are forecast in that a layout can be prepared so as to include parts for several products. By so doing maximum use of metal can be achieved. There are no critical steps involved and an inexperienced operator can learn the process. It is expected that the new process will be a boon to all fabricators who work with sheets of metal having uneven or oxidized surfaces.

Supersonic Measurement Of Metal Thickness

. . . High frequency sound waves have been utilized in the Sonigage to measure the thickness of metal sections where one of the surfaces is inaccessible. The instrument which was first designed for the inspection of hollow steel propeller blades requires contact with only one surface of the object and little operating skill, thus making it readily adaptable to other testing procedures. This paper, describing the instrument and its operating principles, was first presented before the National Aeronautical Meeting of the Society of Automotive Engineers held in Los Angeles Oct. 5 to 7.

By WESLEY S. ERWIN
Research Laboratories Division
General Motors Corp., Detroit

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IN the highly stressed parts of modern airplanes the complete inspection of section thickness after final machining is important. This inspection becomes a difficult problem on some finished parts where the inner surface of a wall is not accessible. In some cases, an instrument requiring only external contact to the part is necessary.

The Sonigage, which was developed particularly for the inspection of the hollow steel propeller blades made by Aeroproducts Division of General Motors is such a device. High frequency sound waves, that is, supersonic vibrations, are used by this instrument to determine the thickness of the material. With the Sonigage it is only necessary to have contact with one surface of the section being measured.

The problem of measuring thickness by surface contact is somewhat similar to that of measuring the depth of the ocean, inasmuch as the ocean bottom is not easily accessible. In 1921 Behm suggested measuring the ocean's depth by sending a supersonic pulse down through the water and measuring the time elapsed until the echo arrived. Since the speed of sound in water is about 4700 ft. per sec., the sound would go to the bottom and return in 1 sec. when the depth is one-half of 4700 ft. This echo is easily separated from the original pulse until the depth becomes less than 100 ft., in which case the time interval is only a few hundredths of a second and hence difficult to measure.

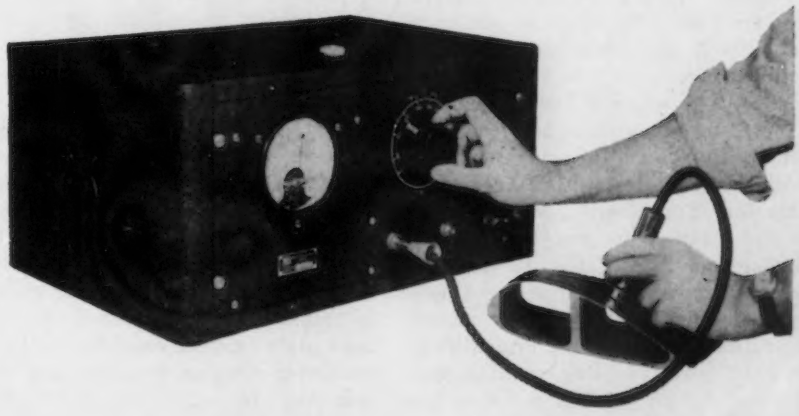
Still shorter intervals are measured with modern radar equipment which determines distance by the reflection time of a radio wave. Short time intervals are involved because the velocity of such a wave is 186,000 miles per sec. and thus even a distance of a few miles is equivalent to only several microseconds. The measurement of such small time intervals involves the use of complicated electronic circuits.

A supersonic wave can be used to measure the thickness of metal parts by the echo method. However, with thin sections the time intervals involved are extremely short. This is due to the high velocity of sound in metals, for example, about 250,000 in. per sec. in steel. Therefore, in a piece of steel ⅛ in. thick, the echo will return in about 1 microsec. Complicated electronic circuits are also involved in these measurements.

An instrument which would be suitable for routine production inspection should be simple to operate and inexpensive to build. These requirements have been met in the Sonigage.

The simplicity of the Sonigage arises from the fact that it does not measure time intervals directly but rather the frequency at which the

FIG. 1—Operation of the Sonigage requires only the pressing of the quartz crystal into contact with the material being measured and then tuning the oscillator dial to the resonant frequency of the work. The quartz crystal converts electrical energy into mechanical vibrations.



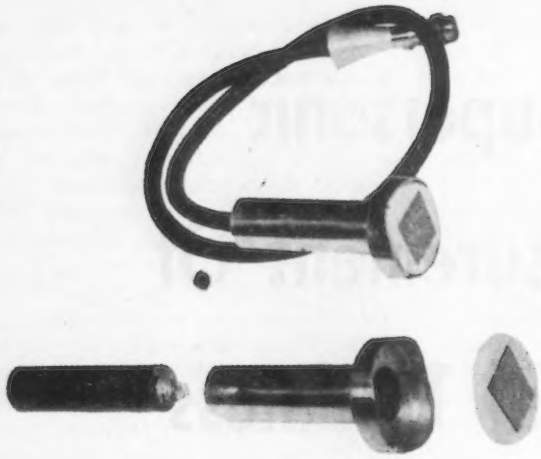


FIG. 2—Typical Sonigage crystal holder and cable. In the unit shown here the quartz is about 1 in. square and 0.06 in. thick. It is silvered on one side to form an electrode while the work serves as the other electrode. The quartz crystal is cemented in a bakelite button which can move up and down between stops in the holder.

work is set into resonant vibration in the thickness direction. Since this resonant frequency in plates of a given metal is directly related to the thickness, the measurement of frequency determines the thickness.

The Sonigage, therefore, consists only of a simple variable-frequency electronic oscillator and a quartz crystal for converting this electrical energy into mechanical vibrations. Operation of this instrument requires only the pressing of the quartz crystal into contact with the material and then tuning the oscillator dial to the resonant frequency of the work as shown in Fig. 1. Due to internal damping of the metal, power is required to maintain this resonant thickness vibration. This power is supplied by the oscillator. A power output meter serves to indicate the resonant frequency of the work in much the same way as a "Magic Eye" on a radio serves to indicate tuning to resonance with a particular station frequency. This resonance point is very sharp and if the oscillator is detuned as little as 1 per cent the indicated power amplitude is greatly reduced. Such sharpness makes accurate thickness measurements readily feasible.

The Crystal: A small flat piece of X-cut quartz crystal is used in the Sonigage. Quartz cut in this manner changes thickness when an electrical potential is applied to its facets. The action is reversible and instantaneous so that when a high frequency alternating potential is applied to the quartz plate faces, the crystal changes thickness rapidly at that frequency. This forced mechanical vibration can be transmitted to any material by placing one face of the quartz plate in contact with it. Since the amplitude of this high frequency motion is ordinarily only a few billionths of an inch, good coupling such as that provided by an oil film between the crystal and the work is required. Brushing the work with oil before testing is sufficient.

A typical Sonigage crystal holder and cable is shown in Fig. 2. In this unit, the quartz is about 1 in. square and 0.06 in. thick. It is silvered on one side to form an electrode while the work serves as the other electrode. The crystal is cemented in a bakelite button which can move up and down between stops in the holder. For stable seating on the work, the holder has a tripod arrangement. A coil spring presses down on the silvered crystal face to keep the quartz in contact with the work. This spring also applies the voltage from the shielded cable center conductor to the silvered crystal electrode. The grounded cable shield is connected to the holder and thus by contact through the tripod, the work is grounded.

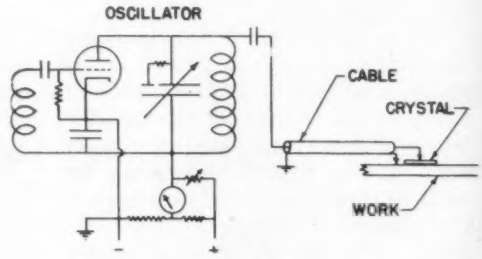


FIG. 3—Simple one tube variable-frequency electronic oscillator used in the Sonigage. By using an efficient coil and good insulation, power losses are kept low so that normal plate current is small.

The Oscillator: The oscillator is a simple one-tube variable-frequency type as shown in Fig. 3. Its power output is indicated by a d.c. milliammeter in its plate circuit. By using an efficient coil and good insulation the oscillator power losses are kept low so that the normal plate current is small. The variations in this no-load plate current encountered in the oscillator frequency range are compensated by adjusting the special loading plate on the tuning condenser. The small constant plate current is then balanced to zero on the meter by the bridge circuit in which the meter is connected. With this arrangement the meter will read only the additional external power output of the oscillator which is drawn by the crystal when the work is in resonance with the oscillator frequency.

It is perhaps well to point out that quartz crystals have their own natural resonant frequencies which depend on the thickness of the quartz. These fixed frequencies are sometimes used to control fixed frequency oscillators but the Sonigage has a variable-frequency oscillator in which the frequency is controlled by its coil and tuning condenser. The Sonigage oscillator controls the forced vibration of the quartz and the crystals used are always chosen so that their natural resonant frequency is higher than the range used for measurements. Then, even if crystal wear does occur, the quartz thickness would be smaller but its resonant frequency still sufficiently high so that no crystal resonance would be observed.

A single crystal is sensitive over about a 2:1 range of thicknesses so that Sonigage oscillators are built to cover a single 2:1 frequency range. Additional ranges would require changing coils, crystals and dial scales. Because of the low cost and extra inspection capacity of separate units no such multi-range models have been built.

The oscillator tuning condenser dial can be calibrated in frequency but for any one metal it can be calibrated to read thickness directly, since the product of the resonant frequency and the thickness will equal one-half the velocity of sound. For any one metal this velocity is a constant and, therefore, the frequency and thickness are inversely proportional.

Work Vibration: For steel the relation is $f \times t = 125{,}000$ where f is the frequency in kilocycles per second, t is the thickness in thousandths of an inch, and 125,000 is one-half the velocity of sound in steel in inches per

second. Fortunately the velocity in steel is not appreciably affected by ordinary alloy content, hardness or heat treatment, so one calibration holds for all common steels.

The amplitude of resonance as indicated on the oscillator meter may be less if the crystal has less contact area with the work due to dirt, lack of oil or curvature of the work. The indicated peak, however small, will nevertheless still be within the 2 per cent accuracy of the Sonigage.

If the crystal is only over a small area of a given thickness, then only a small indication will be obtained but the accuracy of the thickness measurement will be unaffected. If the remainder of the crystal contact area is over another thickness (as on a stepped section) then another indication will be found at that thickness if it is within the range of the instrument.

It is also possible to observe with the Sonigage harmonics of the fundamental thickness vibration such as the second, third or fourth. The indicated resonant amplitudes of such resonance points will be successively smaller than the fundamental indication and this should identify them as such. In the application to the Aeroproducts propeller blade the thickness of the parts before fabrication is known and subsequent operations may decrease but not increase this thickness. In this case Sonigages were designed so that the original thickness fell in the thick end of the range. The thickness can, therefore, be measured unless it is about half the original thickness or less, in which case no indication occurs and the part is rejected as undersize.

In the more general case where the thickness of the work is not known, then the harmonic indications may appear on the dial at points which correspond to one-half, one-third, one-fourth, or other fractional parts of the actual thickness. For example, in such a case the indication might appear on the dial at 0.070 in. and the actual thickness of the sample might be 0.070 in. or 0.140 in. (weaker indication), three times 0.070 in. or 0.210 in. (still weaker). The thickness in this case cannot be less than 0.070 in., but is in between 0.070 in., 0.140 in. or 0.210 in. When two or more of such a series of thicknesses are possible the actual thickness still can be determined by the Sonigage alone.

Two adjacent harmonic dial readings R_1 and R_2 are taken. Since these will be $\frac{1}{n}$ and $\frac{1}{n+1}$ of the total thickness t, then $R_1 = \frac{t}{n}$ and $R_2 = \frac{t}{n+1}$. The solution of these two equations yields $t = \frac{R_1 R_2}{R_1 - R_2}$ or the product of two adjacent readings divided by their difference is the actual thickness.

Conclusion

Briefly it can be said that the Sonigage is an instrument for rapidly measuring the thickness of metal sections in the approximate range of 0.020 in. to 0.400 in. with a maximum error of less than 2 per cent. It requires contact with only one surface of the object being measured. The simplicity of operation is such that no particular skill is required.

It has been used to measure the thickness of propeller blade walls and it should be applicable to other inspection problems where rapid inspection of sections is necessary.

Acknowledgment

The author would like to express his sincere appreciation to Drs. E. J. Martin and G. M. Rassweiler of the Research Laboratories, for their able direction of the research work on the Sonigage; to R. F. March of Aeroproducts Division for his help and patience in applying the instrument to the inspection of propeller blades, and to C. E. Quinn of the Research Laboratories, for excellent construction design.

Tiny Internal Cam Miller Devised

DESIGNED to cut two irregular curved tracks of minute dimensions on the inside of an aluminum alloy barrel 1⅜ in. in dia. by 3 in. long, a special cam cutting machine has been devised by Fairchild Camera & Instrument Corp., New York, which completes in 15 min. a job that formerly consumed 80 hr. of highly skilled labor.

The equipment, which was designed by Edward Lay and Theodore Fraser, consists of a carriage mounted chuck which can be rotated by a worm and wheel and advanced longitudinally by two master cams bearing against stationary followers in the base, and secondly a small motor driven end mill spindle. In one revolution of the master cam the barrel turns three times and a track is milled on its interior surface. This revolving action is attained by one worm and two worm gears. Weights keep the master cams in contact with the stationary followers. The tiny cutter is mounted vertically on an extended arm and is driven by a fractional horsepower motor through a round belt.

Mounted on ball bearings, the carriage action is so sensitive that through its handle the cutter's slightest dullness or smallest break can be detected by the operator. The machine was constructed by welding all parts except the cast iron base.

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A METAL barrel held by the operator will be milled by the belt driven cutter, in the vertical head directly under the lamp. Kerosene flows through the tank above lamp. Flat master cams beneath the hook, right, govern the longitudinal motion of the carriage motion. Left of these is the carriage crank handle.

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What Quenching Oil *Not* to Use

. . . A discussion of modern quenching oils, with the proper selection of base stock and subsequent fortifying with additions to secure oxidation stability and quenching speed. The results are predictable properties of treated steels, uniformly and regularly in mass production.

By G. W. PRESSELL

Executive Vice-President,
E. F. Houghton & Co.,
Philadelphia

IF the article "What Quenching Oil to Use"* had appeared in THE IRON AGE in 1904 instead of in 1944, it might have been regarded as somewhat of a contribution to the subject of quenching—then more of an art than a science. But to have an oil producer attempt to tell metallurgists today that quenching is an "Indian rope trick" and that all the work they have done over the past 30 years is hokum, doesn't compliment them, to say the least. From their own investigations they know otherwise—and it is their finding, not that of any oil company, that we desire to present here to refute the opinions expressed in the article referred to.

* *Article by W. G. Forbes, issue of Aug. 3, 1944,* THE IRON AGE.

There is no "mystery" involved in a quenching operation. Its only purpose is to cool heated steel as rapidly as possible so that certain desired properties can be uniformly and regularly obtained in mass production. To say that "no one knows what actually causes steel to become hard when heated above a certain critical temperature, then plunged into something cold," is to ignore the findings of independent, free-thinking metallurgists since World War I.

When S-curves and hardenability ratings were established and recognized a few years ago, a big forward step was taken in heat treatment. It is known that the quenching time-temperature curve must not pass through the nose of the S-curve, or maximum physicals will not be obtained, and it is known where that nose is, for most analyses of steel.

Hardenability is now an established factor; the American Iron and Steel Institute is offering a plan to buy steels on the basis of hardenability bands rather than on physical analysis.

So the data accumulated by metallurgists regarding quenching in past years all tie in today with these later standardizations to make a pattern of surety and understanding and uniformity. It's like an aerial map, put together in bits until the whole ground plan unfolds in visual clarity.

It is elemental to state that water quenching is too severe, and that oil was long ago adopted because it produced a better structure, with stresses minimized. And today it is also elemental to add that oils can be fortified by science so that the resultant product will serve more efficiently as a quenching medium.

There is more to selection of a quenching oil than specification of physical properties — fire, flash, viscosity, etc. That is only the beginning. Two other characteristics must be built into the oil, namely, *oxidation stability* and *quenching speed.* Both of these merit discussion, based on users' opinions and findings.

The first step in manufacturing a proper quenching oil is selection of the base stock. Experience has proved that the stock used must have many of the properties of a high grade lubricating oil-oxidation-resistant and refined by a method which assures a minimum amount of light ends—less chance for fractional distillation.

Then that high-grade stock, superior originally to the ordinarily termed "28-degree paraffine," is further fortified by additions of inhibitors and anti-oxidants which prevent sludging and thickening of the oil during long severe service.

It is self-evident that oil should not be prone to decomposition under the influence of immersed hot steel. The oil should be so made as to avoid distillation of light ends under heat. Oxidation means sludge and a clogged cooling system. To quote from p. 67, A.S.M. Transactions, vol. 33, in a discussion of this problem by F. E. Rosenstiehl, of the Texas Co.:

"It has been our experience that certain quenching oils are more prone to chemical deterioration or oxidation than others through use. The more unstable oils are liable to cause formation of troublesome sludge or carbonaceous deposits. These may not be serious enough in themselves to necessitate replacement, though they may lead to trouble in oil cooling systems . . . and even change the quenching characteristics of the quenching medium. Further, through use, certain of the more unstable quenching oils may show appreciable changes in their physical characteristics, such as viscosity increase, or decrease in flash or fire points."

A Continental Oxidation Test was recently conducted by an impartial laboratory on a number of oils offered for quenching. In this test the oil is held at 341 deg. F. for 48 hr., using an iron wire catalyst, and with air bubbled through the oil at a rate of 10 liters per hr. Thus oxygen, iron and heat are present to break down the oil at an accelerated rate. At the

end of the 48-hr. period, these were the findings:

	Treated Oil	100-Deg. Paraffine
Viscosity at 100 deg., new oil	110 sec.	102 sec.
Viscosity at 100 deg., after test	118 sec.	149 sec.
Percentage increase in viscosity	7.4	47
Carbon residue, new oil, percentage	0.19	0.05
Carbon residue, after test, percentage	1.2	3.8
Neutralization number, new oil	0.13	0.13
Neutralization number, after test	1.9	6.4
Hours for 10 mg. sludge	3	1
Hours for 100 mg. sludge	42	1
Total sludge, 48 hr.	117 mg.	448 mg.
Color	4	5

The foregoing figures explain why results vary so greatly as between new and used oil which has not been selected and fortified for stability. Note also Fig. 1, based on tests of new vs. used oil, both types, and offering conclusive proof that an oil may be treated so as to render it longer-lived.

The second feature which a modern quenching oil must possess is quenching speed. When war shortages affected the available supply of alloying elements, and NE steels had to be developed, the work which had been done in perfecting speedy quenching oils proved a life-saver to heat treaters. The situation forced those in charge of metallurgical laboratories of large metal working plants to make investigations of their own; the results were startling in their unanimous decision favoring specially treated oils for quenching.

Tests quoted herein are the result of research in the nation's largest industrial laboratories and borne out in plant performance. Their sources may be cited specifically if requested. They are not Houghton figures, although the author's company could of course present similar proof.

As an example of the need for fast quenching oils in war production, consider the vast shell manufacturing program. That type of oil, stable and possessing a fast rate of quenching speed through the critical zone, enabled shell manufacturers to use plain carbon steels, conserving scarce alloying materials. Equal or even superior physical properties were obtained without it being necessary to use high-alloy steels.

To attain this quality of speed, the inhibited base oil is further treated by the addition of wetting agents which enable the oil to wet out the steel more rapidly, dissipating heat faster and eliminating any vapor pockets that may have formed in the initial phase of the quenching operation.

E. E. Thum, editor of *Metal Progress*, editorialized in the September, 1944, issue of that paper after discussing fast oil quenches:

"To increase the quenching power of oil, therefore, it was necessary to find some addition agents that cause the vapor sheath to collapse more quickly, in say 5 sec. (so the cooling curve is moved to the left and does not cut the nose of the S-curve). Such agents do not change the shape of the lower part of the cooling curve, below say 700 deg. F., the approximate boiling point of the oil.

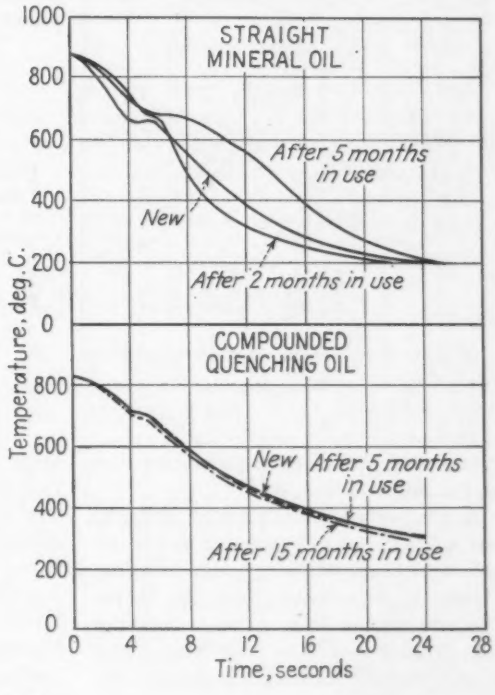
"From here on down cooling is by conduction to liquid bath, and is slow enough so that the temperature throughout the piece has a chance to equalize and also the austenite-to-martensite reactions, with accompanying volume changes, cause a minimum of warpage and residual internal stress."

One of the country's largest metal working plants ran its own test on quenching oils, later releasing the results. The cooling curves in Fig. 2 are presented as evidence of the results in favor of an additive-type oil, which comes halfway in speed between straight mineral oil and water.

That test was on stainless steel; in the Houghton files is another test run by another automotive manufacturer on SAE 1020 steel. Fig. 3 is presented to prove also the same clear evidence

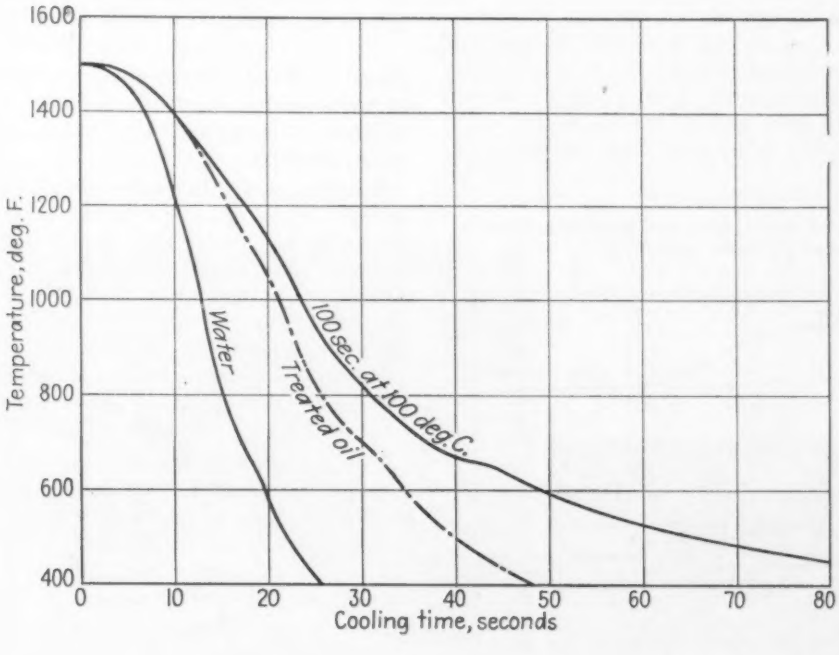
RIGHT

FIG. 1—Treated oil and 100-deg. paraffine oil, new and used, compared to show that oil may be treated to render it longer-lived.



BELOW

FIG. 2—These data are in favor of an additive-type oil, which comes half-way in speed between straight mineral oil and water. Still quench; air cooled 1550 to 1500 deg.; thermocouple at center of 1-in. round by 3-in. stainless steel specimen; quenching mediums at 100 deg. F.; quenching tank, 1 gal. capacity.



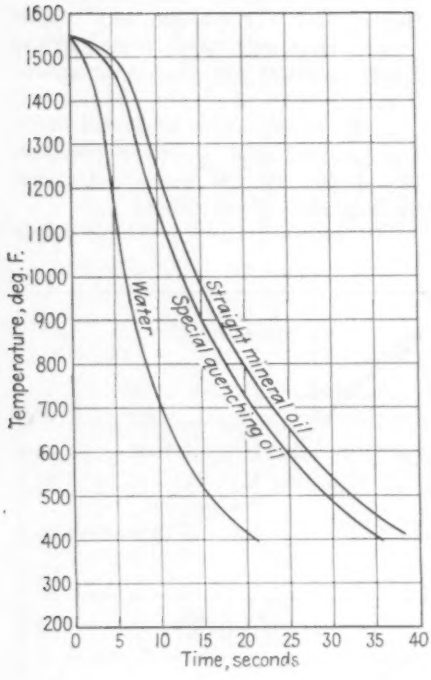


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FIG. 3—Test on SAE 1020 steel to show variation between treated and straight oils.

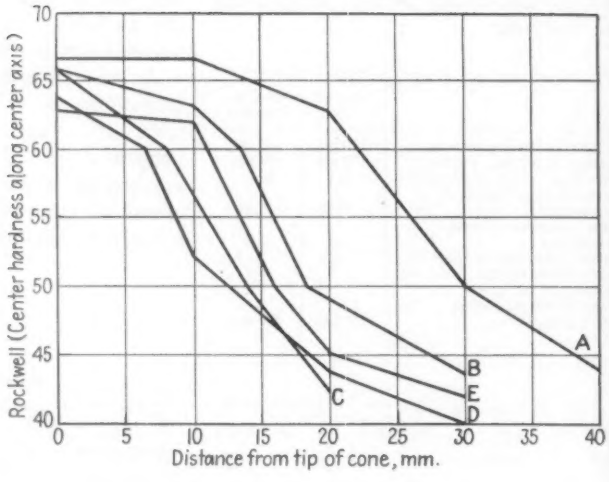

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FIG. 4—Illustrating hardening effect of a compound quenching oil. Steel, 0.90 C and 0.50-0.60 Mn; 20 min. to heat and 20 min. at 1475 deg. F.; A = Houghto-Quench; B = 100 vis. mineral oil No. 1; C = 100 vis. mineral oil No. 2; D = 100 vis. mineral oil No. 3; E = 100 vis. mineral oil (used).

of a speed variation between treated and straight oils.

A properly manufactured quenching oil will give a greater depth of hardness than will a 100 deg. paraffine oil or any reasonable facsimile thereof. The reason lies in faster wetting out, greater ability to absorb heat and eliminate formation of gas pockets on the surface of the steel.

An interesting test was made by a steel company several years ago which demonstrates that point. (Note: None of these are oil company tests.)

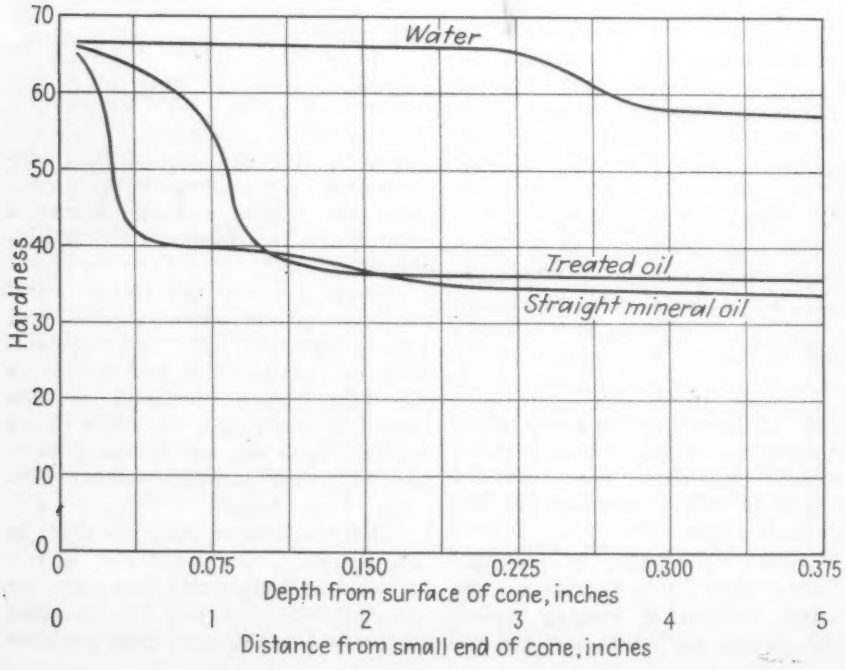
Cones of 0.90-carbon steel, 5 in. long, 1 in. diameter at base, tapering to a blunt point, were hardened in the five media in the caption. After hardening, the cones were cropped ¼ in. below the apex and reduced by grinding to triangular sections of the center of ¼ in. thickness. Rockwell C hardness tests were made of these sections at the tip and at points 10, 20, 30 and 40 mm. below.

Line A, Fig. 4, reveals the superior hardening effect of a compounded quenching oil. Even at what had been the thin end of the cone this superiority is evident; tests of the specimen quenched in that oil show substantial margin of improvement over the cones quenched in straight mineral oils, as the base of the cone was approached.

Here is another steel company test, showing hardness curves for quenched cones, somewhat similar to the preceding test except that a higher-alloy steel was used. The analysis showed: C0.79, Mn0.21, P0.021, S0.019, Si 0.21, Ni0.10, Cr0.12, and Mo0.19.

Cones 5 in. long, 1 in. diameter at large end and ¼ in. diameter at small end, were quenched from 1550 deg. F. and hardness readings taken along a flat grind, parallel to ⅛ in. distance from the cone's axis. The result, shown in Fig. 5, proves again that an oil made solely for quenching shows a hardness closest to that produced by water quenching.

FIG. 5—Additional data to illustrate that an oil made solely for quenching shows a hardness closest to that produced by water quenching.



Another report has come from the Detroit laboratory of a motor plant preparing to reenter the automotive business. The report is entitled "An Evaluation of Quenching Oils." The test employed 1½ in. ball studs of NE 8750, quenched from 1550 deg. F. into water, a treated oil and a straight untreated mineral oil, at room temperature.

The results of Rockwell C traverses through the heavy section are shown in Fig. 6. The oil made solely for quenching produced hardnesses almost comparable to results from the water quench, yet without the severity of the latter type. The straight mineral oil quench showed up 2 to 5 points lower on the Rockwell C scale.

As further proof, consider a written discussion by a Springfield Armory metallurgist, on a paper presented at the 1943 A.S.M. Conference (p. 67, A.S.M. Transactions, vol. 33):

"Our experience has indicated that the differences in cooling capacity of various oils assumes considerable significance when engineering steels are

involved. Reference is made to a number of heats of steel which it was impossible to fully harden only by using an oil with a high initial quenching speed.

"In one case, a 1.25-in. section of SAE 4150 steel failed to harden when quenched into a straight paraffin base mineral oil with a low initial quenching speed, whereas this same heat hardened uniformly and throughout the full section when quenched into an oil having a high initial quenching speed. In another instance a similar improvement in hardening various lots of SAE X1045 strip steel was accomplished with a change in the quench oil."

These tests constitute uncontrovertible evidence of the point made here: that if a quenching oil is made to have certain properties, the resuits demanded will be obtained. There has been no discussion of agitation and temperature of the oil here for the sake of brevity. Both are important, of course, but neither will suffice to make up for the defects of straight mineral oil as a quenching medium.

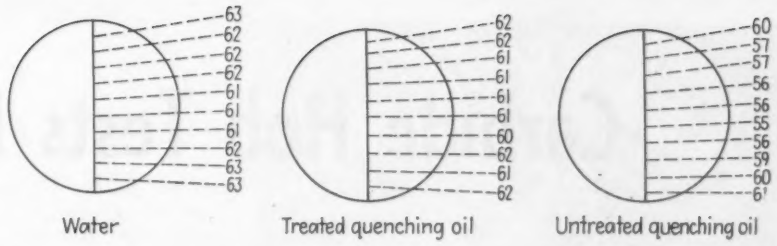


FIG. 6—Rockwell C traverses made through the heavy section of ball studs of NE 8750 steel, after quenching in treated oil and in straight untreated mineral oil, at room temperature.

Adjustable Racks Speed Aluminum Anodizing

ADJUSTABLE racks designed by employees in the finishing and plating department have almost halved the time required to load work for anodizing at the Glenn L. Martin Company, Baltimore. In addition, the use of these racks in place of spring hangers for all tubes, formed parts and heavy gage flat work has resulted in substantial savings in electric current and has permitted a far greater utilization of the available anodizing tanks, thanks to the orderly arrangement of the parts.

There are two basic types of rack, each being made in several sizes so that by using them singly or in combination practically every size and type of part can be handled. The first type, Fig. 1, consists of an aluminum alloy center post with a frame at the bottom on which parts can be stacked crosswise in the manner of a log cabin and a spring actuated pressure plate at the top to hold the racked work in place. The vertical edges of the bottom frame are toothed to keep the work from slipping, and the top of the center post is in the form of a hook to permit handling with an overhead conveyor.

The second type of rack, Fig. 2, has two posts with a fixed channel section separating them at the bottom and a movable section at the top. Top edges of the lower section and bottom edges of the top section are toothed to prevent slipping. Work is loaded on the bottom section and the top clamped down to hold it in place similarly to the single post racks. In loading large parts which would cover each other, such as large corrugated sheet, smaller parts are used as spacers, thus utilizing the solutions to the utmost and ayoiding to a large extent their waste on handling equipment.

The new racks are both simple and durable and provide a sure and positive electrical contact. Where the former spring hangers had to be cleaned after each usage and soon lost their temper and springiness, the new racks have an almost indefinite life, with only the bottom frame having to be cleaned after usage. Since this metal frame is of straight construction, it is easily cleaned.

LEFT

FIG. 1—Parts are unloaded from a single-post anodizing rack at the Glenn L. Martin plant. In the background can be seen several of the loaded racks showing how the parts are criss-crossed around the pole.

BELOW

FIG. 2—Loading long stringers on to the two post type anodizing racks. Smaller parts are used as spacers to hold the longer parts apart.

Carbide Hob Tests Feature AGMA

. . . Reported tests on cutting of steel marine drive pinions at the Joshua Hendy Iron Works with carbide tipped hobs presage future possibilities of speeding up gear cutting by this means, despite high initial costs of the experimental tools. Other papers presented at the 27th semi-annual meeting of the American Gear Manufacturers Association, held in Chicago last week, are also briefed.

ALTHOUGH still in the developmental stage, possible future use of carbide tipped hobs for cutting marine propulsion gears and other work is indicated by experiments made at the Joshua Hendy Iron Works, Sunnyvale, Cal., under the auspices of the Navy Department. Results of these tests and plans for extending them were described at the 27th semi-annual meeting of the American Gear Manufacturers Association, held in Chicago, Oct. 30-31 and Nov. 1, by Lt. Alfred L. Kroog, Bureau of Ships, and Richard W. Righter, civilian engineer in the Navy Department. The chief limiting factor in the initial tests was the speed and rigidity of available hobbing machines. Faster and heavier machines are now under construction.

When it became apparent in 1942 that even the best available hobbing methods could not keep pace with the program for the production of marine steam propulsion equipment, the Bureau of Ships, Navy Department, initiated research into the possibility of improvements in gear cutting speed. Ordinarily, speeds and feeds for hobbing large gears and pinions are set way below maximum so that one hob will finish the cut without undue wear. Hence an inserted tooth hob was developed, to which various cutting materials, including carbides, could be applied. Two hobs were constructed by the Cleveland Hobbing Machine Co. They had to be large enough to permit clamping of independent strips of various cutting materials, had to have heavy enough backing to support the carbide and finally be suitable for a comparatively large arbor hole to insure maximum rigidity during the cutting action. The hob, illustrated, is 6 in. diameter, 6 in. long, with mechanically held strips to which cemented carbide cutting edges were brazed. This is a five pitch, single thread hob tipped with Kennametal K4H. Arbor diameter is 2½ in. Another hob was made up of inserted blades tipped with 18-4-2 (Braeburn Twin Van) high speed steel.

Experience with carbide tipped milling cutters had indicated the necessity of maintaining a maximum chip load per tooth and of using heavy feeds; also the advantages of climb cutting. Fine feeds and thin chips cause rapid failure due to abrasion of the carbide. At the start, Lt. Kroog emphasized that one of the factors contributing to the success of the hob was use of climb cutting.

Tests were conducted on a new 72-in. Gould & Eberhardt hobbing machine, using the maximum available spindle speed of 100 r.p.m. This corresponded to a peripheral speed of 150 ft. per min., which although low for carbides was the highest obtainable. Climb cutting was used, with feed up and rotation of the hob down. Feed of 0.049 in. per rev. of the gear blank was used. Low carbon steel pinion blanks for C-3 ships approximately 21 in. in dia. and with a face of 18⅞ in. were cut.

Finish Excellent

On the first cut at the full roughing depth, a slight knock developed in the spindle bearing after cutting about 2 in., indicating a chipped tooth. The hob was removed and it was found that its low position on the spindle had resulted in the full load of the cutting action being taken on the lead tooth. This was corrected by moving the hob up in order to distribute this load toward the center of the hob. The hob was touched up with a diamond hone, reset and then cut the entire gear face. The finish of the gear teeth was considered excellent, and the helix angle checked within 0.0001 in. in 15 in. of length. The cutting action of the hob was very good. There was no chatter or vibration during any period of the cutting and the only difficulty encountered was excess heat in the spindle bearings at the top speed of 100 r.p.m. This required continuous attention, but the bearings held up satisfactorily, and proved to be none the worse for the experience on later runs. Lt. Kroog attributed the excellent cutting action to the combination of speed, feed and climb cutting. The chip formation was good and gave further evidence of a clean cutting action.

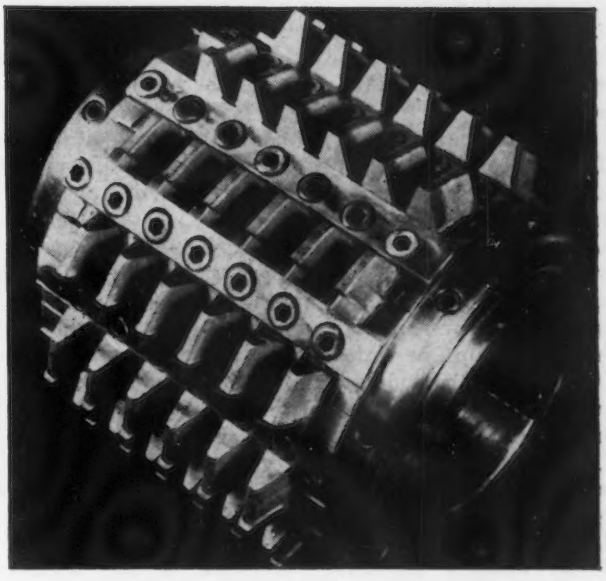
A second hob, similar in design to that illustrated, but with strips of 18-4-2 high speed steel, was run at 50 r.p.m. (75 ft. per min., approx.) with 0.040 in feed per rev. of the gear blank. Under climb hobbing conditions this hob performed very satisfactorily, with a clean cutting action. The surface speed of 75 ft. per min. was just about twice as fast as the speed used with regular high speed steel hobs when roughing. In order to confirm the belief that climb hobbing, regardless of the type of hob used, is the most efficient manner of hobbing, this same 18-4-2 hob was used in the conventional manner in cutting a third gear at the same speed and feed. The hob did not perform nearly as well; in fact, it dulled so rapidly that the last few inches were cut with the machine laboring noticeably.

Except for the chip caused by the first setting of the hob, it was estimated that it would have been necessary to remove approximately 0.010 in. from the face of the carbide teeth in order to sharpen the hob. Actually, however, this chipping necessitated grinding 1/32 in. from the face of the teeth, reducing the carbide insert down to 5/32 in., which was considered entirely too thin for recommended practice. This was done with a phenolic bonded diamond wheel of 220 grit and, after finishing, the sharp edges were stoned lightly to minimize chipping. The hob was then used to cut another steel pinion and performed equally well as on the first run; no chipping occurred.

Lt. Kroog indicated that the Navy

Meeting . . .

Department intends to modify a 72-in. Gould & Eberhardt hobber in order to obtain the increased speed and rigidity necessary to determine the productive possibilities of composite hobs. Spindle speeds up to 194 r.p.m. will be available and a flywheel will be provided to assure a more uniform motion under interrupted cutting conditions. An automatic force feed system will be provided the plain bearings on the hob spindle and the work arbor support will be strengthened. It is planned to run further tests under roughing and finishing cuts, using 18-4-1 and 18-4-2 inserts subjected to sub-zero refrigeration, also Tantung G and Stellite grade 98-M-2. For the finishing cuts the two grades of refrigerated high speed steel will be tested as well as hobs tipped with Kennametal K4H, Carboloy 78 and Vasculoy-Ramet E. For the carbides, spindle speeds of 180 r.p.m., corresponding to 270 ft. per min. peripheral speed, will be tried at a feed of 0.090 in. per rev. of the blank.



IN this 6 in. diameter hob, Kennametal K4H tips were brazed to metal strips which were held in the hardened SAE 1040 steel body with tapered wedges and set screws. It cut a steel pinion of 5 d.p. and 14½ deg. nominal pressure angle, approximately 21 in. in diameter and 19 in. face, in about one-third the time normally required.

Can Cut Harder Gears

Lt. Kroog expressed the hope that carbide hobs and the new hobbing machines will make it possible to cut gears of a higher tensile strength and hardness than has been heretofore considered possible. Such gears, he said, should be capable of transmitting more power per inch of gear face and should undoubtedly have much longer life. Under good operating conditions for carbide hobs, much longer tool life also could be expected. He envisioned that it might be possible to cut several gears with one sharpening of the hob.

In the discussion that followed it was generally agreed that the tests were promising but that not enough data had been accumulated to point to a definite solution of the carbide hob problem. Comments ranged all the way from "possibilities enormous" to downright skepticism. Louis Falt, executive engineer, Falk Corp., for instance, stated frankly that he was not impressed with the results to date. He maintained that chatter is the limiting factor in stepping up the speed of gear cutting and that even with the special hobbing machines built by Falk (which at a previous meeting of the AGMA had been characterized as being "overdesigned" from the point of view of heft and rigidity) hob chatter invariably occurred at the higher spindle speeds. Mr. Falk admitted the possibilities of cutting gears of higher hardness with carbide hobs, but he questioned the gain in gear life that might be expected. Propeller drives in battleships have not shown signs of wear after 25 years service, he reminded Lt. Kroog.

John T. Maddock of the Joshua Hendy Iron Works and others who had witnessed the tests emphasized the superiority of finish obtained, which is quite different from that produced by conventional hobbing. The series of flat lands on the tooth profile are missing and the teeth have more the appearance of shaved gears, it was said.

Experimental Hobs Costly

Otis E. Staples, Cleveland Hobbing Machine Co., added some interesting sidelights on the construction of the hobs and the conditions under which they were tested. Originally, a quotation of $10,000 was made for the first two experimental hobs, but under Navy protest this figure was reduced to $3500. "We already have put in $3500 of direct labor on these tools," Mr. Staples stated, adding, "And that does not include $1700 which Kennametal is absorbing."

Staples attributed much of the success of the tests to the use of a big arbor, which was more than doubled in size. The diameter of the hob was stepped up from 4 to 6 in. to obtain higher peripheral speeds necessary for satisfactory carbide performance and this enabled a 2½ in. arbor to be used, while still retaining generous clearances between the gashes. The hobs have 11 gashes. In starting up the machine, the hob was fed manually into a depth of cut of 0.015 in. but instead of decreasing the feed to about 0.002 in. as the root was approached as in conventional practice, the cut was ended with a feed of 0.010 in. This was a big factor in reducing the total machining time, besides the faster cutting speed used, Staples said.

Cracking of tips was admitted to be a serious difficulty especially in a multi-tooth tool of this type, but Staples concluded that the carbide hob is definitely an answer to faster gear cutting.

The fact that carbide hobs are not entirely new was proved by Leo Reuland, Barber-Colman Co., who exhibited a small carbide tipped hob made six years ago for cutting Fibrock graphite impregnated magneto gears. The carbide tips were brazed directly to a high speed steel body. Where before only 280 gears could be produced between grinds of a conventional hob, this carbide hob produced 5000 gears during its first run. To date it has produced over 36,000 gears of this highly abrasive material and has only been reground three times. In this connection, he said that grinding the tool is the chief headache. Diamond wheels are expensive and may readily be destroyed by a careless operator. Later it was brought out that a vitrified diamond bonded wheel was under development that had considerable promise from the economic point of view.

Reuland took issue with the authors that mechanically clamped carbide strips are better than tips brazed directly into the body, maintaining that the necessary accuracy for Class A hobs could not be so obtained. He

concluded that carbide hobs are coming but that heavier machines will first have to be built and a grade of carbide less subject to chipping developed.

A representative of Kennametal, Inc., indicated that tests so far show that clamping the tip is the safer method of holding tips in milling cutters and that similar conditions prevail in a hob. Considerable increase in cutter life has been obtained with clamped tips over milling cutters having brazed tips, he stated.

Several in the audience agreed that use of climb hobbing is efficient and has attractive possibilities. Although the machines on which this type of cut can best be employed should have a backlash eliminator on the feed screw, the method can be applied on many existing machines. Granger Davenport, Gould & Eberhardt, indicated that climb hobbing had been used for 10 years or more but that it was difficult to predict its success on any particular job. He urged, however, that it should be practiced more, especially in cutting steel gears. He saw little benefit to be obtained in climb hobbing of cast iron gears.

Worm Gear Contact Temperatures

An exhaustive study of worm gear contact temperatures was reported by George H. Acker, vice-president, Cleveland Worm & Gear Co. The instantaneous or "flash" temperatures generated at the contact surfaces of a steel worm and a bronze gear were measured by making the worm and gear opposite elements of a thermocouple. This was done by bolting the bronze gear to a Textoline hub, thus insulating the rim electrically from the supporting shaft. These data indicated that the flash temperature tends to vary directly with the loading, which is to be expected, and that it is reduced by increase in sliding velocity or speed, probably as a result of better lubrication. What is more important is that the data revealed that the flash temperatures are not at all alarming in value, as some British investigators had shown.

Mr. Acker was particularly interested in the effect of reducing the mass temperature of the oil on the flash temperatures at the contact areas since his company is now offering a compact worm gear drive in which external cooling fins and forced air circulation is used to reduce the temperature of the oil bath and thereby raise the thermal rating of the unit. In the tests, the oil was first cooled by recirculating it through cooling coils. The results indicated that any reduction in oil bath temperature, other factors remaining the same, would produce an equal reduction in the averaged contact temperatures achieved.

In later tests on the air cooled housing, however, it was noted that at the lower speeds the averaged contact temperatures were not reduced to quite as great an extent as the oil bath temperatures were, resulting in flash temperature gradient values 5 to 10 deg. higher, load for load. Compared with a conventional drive, however, the absolute values are actually lowered and appear to the author as adequate justification for considering increases in the rating of worm gearing for power transmission purposes, particularly in the higher speed range.

It has long been obvious, Mr. Acker pointed out, that from the standpoint of strength, worm gearing is capable of carrying much higher loads at high speeds than AGMA thermal ratings would tolerate. Empirically, this factor has acted to discount the mechanical rating at high speeds, indicating the necessity in extreme instances of reducing the allowable loading at 1750 r.p.m. to one-sixth of that at 100 r.p.m., while reductions of one-quarter are the general rule.

The new fan cooled housings have been given a much higher thermal rating in view of the control of oil bath temperatures insured. Since this is a new venture in this country (the British have been using fan cooling since 1923) it will take time to acquire the field experience considered a necessary prelude to standardization of such higher ratings, but Mr. Acker expressed the hope that eventually such a standard rating practice would be adopted by the association.

Vibration Problems

A lucid and interesting discussion of the fundamental mechanics of vibration and means of balancing rotating machinery was given by F. C. Rushing, Westinghouse Research Laboratories. By a simple example, he illustrated the principle that at the natural frequency, energy is stored in the vibrating system, the input being proportional to the amplitude of the motion multiplied by the force. Hence, even if a vibrating force is present it can contribute no energy to the system if the amplitude of motion at the point of application of the force is reduced to zero.

In the example of a large electrical machine about 18 ft. in diameter which had a serious frame vibration, examination of electrical forces (magnetic) which were producing the vibration revealed the probable points of energy input were at the extreme top and bottom of the frame, where vibration motions were greatest. To prevent energy input, the bottom of the frame was hinged to the foundation with a lengthwise plate. The resulting system was still capable of vibrating at the same natural frequency, but the exciting force, though still present, could contribute no energy since the bottom could not move up and down; hence the vibration disappeared.

Mr. Rushing also showed that vibration does not fatigue a shaft since there is always a fixed phase relationship between the center of mass and center of rotation at any speed. Illustrating an unbalanced disk on a flexible shaft, the speaker showed that the bow assumed by the shaft remains fixed as it rotates about the axis of the bearings. Below the critical speed, with an unbalanced load, the center of gravity and the "high spot" on the shaft are in phase; at the critical speed, the center of gravity leads the high spot by 90 deg., while above the critical speed, the high spot and the center of gravity are 180 deg. out of phase. Hence the fiber stress is not reversed at each revolution.

Rushing gave as typical allowable deviations of the center of gravity from the center of journals for "balanced" units, as follows:

Class of Unit	*Deviation, In.*
Some large slow speed rotors	0.015
Large high speed generators	0.001
Medium size motors (5 hp)	0.0005
Machine tool motors	0.00005
Vacuum cleaner motors	0.00005
Gyroscopes	0.00002 to 0.0000025

Contract Termination

In reviewing some of the features of the Contract Settlement Act recently passed by Congress, Lt. Col. Francis W. Fisher, Readjustment Branch, Army Services Forces, emphasized that both small and large manufacturers would do well to settle terminated contracts by negotiation rather than by the application of the formula provided in the law. The latter sets a maximum profit of 2 per cent on unused raw materials purchased, 8 per cent on labor on uncompleted parts and an overall ceiling of 6 per cent on all monies expended in processing cancelled parts. By negotiation a more reasonable settlement often can be obtained. A great deal of discretion is left to the contracting officer in a negotiated settlement, of which many hundreds have already been made.

Colonel Fisher described how contract termination teams had been set up by the Ordnance Department to facilitate settlements. The basic elements of each team are the negotiator

(CONTINUED ON PAGE 151)

An Appraisal Of Precision Thread Rolling Practice

By FRANK J. OLIVER

. . . In rolling high strength materials, nominal machine ratings should be halved if accuracy is to be obtained. In the second part of a three-part article die design factors are discussed and the performance characteristics of the several grades of tool steel employed for flat dies are compared.

IN selecting a straight die machine for threading hardened materials, the manufacturer's published ratings (based on rolling mild steel bolts) cannot be accepted. Some engineers advise halving the nominal capacity, that is, roll ⅜ in. screws on a ¾ in. machine; or at best, two-thirds as rolling ¼ in. screws on a ⅜ in. machine. Two reasons are offered: First, greater heft and rigidity and hence longer wear life of parts and even more important less "spring" in the frame under load; second, longer stroke permitting use of longer dies. By lengthening the rolling action, more rolls or contacts of the blank are obtained with consequent lessening of the reduction obtained per contact. In soft work, the thread is completed to depth in four or five contacts of the blank: in high strength materials eight revolutions of the work is to be preferred and 10 will do no harm. On circular die machines, the work may be spun 80 to 100 times on the hardest materials or on thin wall tubing where the penetration of the dies per turn must be kept low.

Speeds of rolling are obviously much lower when hard materials are being threaded since this factor greatly influences die life. There is a limit even to this. As die life drops to around 3000 to 5000 pieces at even the lowest speeds when rolling materials above 40 R_c, grinding becomes the most economical method. In the usual range of hardness encountered in heat treated aircraft steels, namely 28 to 32 R_c, straight die machines are operated at speeds from 20 to 30 strokes per min. Attempts to get 60 to 80 pieces per min. as in soft stock only produce scrap. The best caution is the slower, the better, except on number size screws. One of the leading aircraft stud producers, on the other hand, gets an output of 40 per min. and with it an exceptional die life, running up to 85,000 pieces for a single faced die. Here extreme care is exercised in making the dies which are ground but not lapped and which incorporate an approach action built into them. This is one of the few concerns doing a good job on SAE 3140 steel studs.

Most producers would do well to obtain 30,000 pieces off a single face die and in the hardness range of 35-36 R_c, 5000 to 10,000 ends in SAE 3140 is all that can be expected. On the other hand, 200,000 pieces have been obtained on a double faced die when rolling annealed SAE 3140 at a hardness of 24 R_c. For this application machines are run at 30 to 55 strokes per min., depending upon the size of the bolt, ¾-10 being the largest.

Circular die machines have not been in use long enough to obtain reliable data on die life.

Die Design Factors

Although it is obvious that in rolling precision threads in high tensile materials the machine should be in good working order and free from looseness or play between slides and bearing members, nevertheless the final accuracy must be built into the dies themselves and in their proper mounting in the machine. In this latter connection one authority on the subject has made the remark that great patience and great technique is required to set up straight die machines for precision work. As has been indicated before, a screw thread rolled by mismatched dies will find the grooves running into the crests by the time the bolt or cap screw has made a half turn. Considerable attention has been given to this factor in the design of the machines themselves in that for proper matching it is necessary not only to line up the dies properly but also to introduce the blank at the exact instant at which the facing helix angles intersect when the groove of one die is exactly opposite the crest of the mating die. The problem of die matching is one peculiar to each machine and the reader is referred back to the description of each particular unit on this score. (See also later comments on slippage in flat die work.)

Lead error in the final thread form depends entirely upon the accuracy with which the dies are made. In aircraft stud and bolts, lead error must be held as low as 0.0002 in. in 1 in. With such accuracies as this to contend with, it is surprising to find widely different methods being used in the manufacture of straight dies, with each proponent claiming that his system is superior. (Circular dies all have ground threads.) Practically all straight dies are hobbed on standard milling machines with a multiple thread cutter having 0 deg. lead, similar to a thread milling cutter used on circular work. Thereafter, the similarity ceases for it should be noted

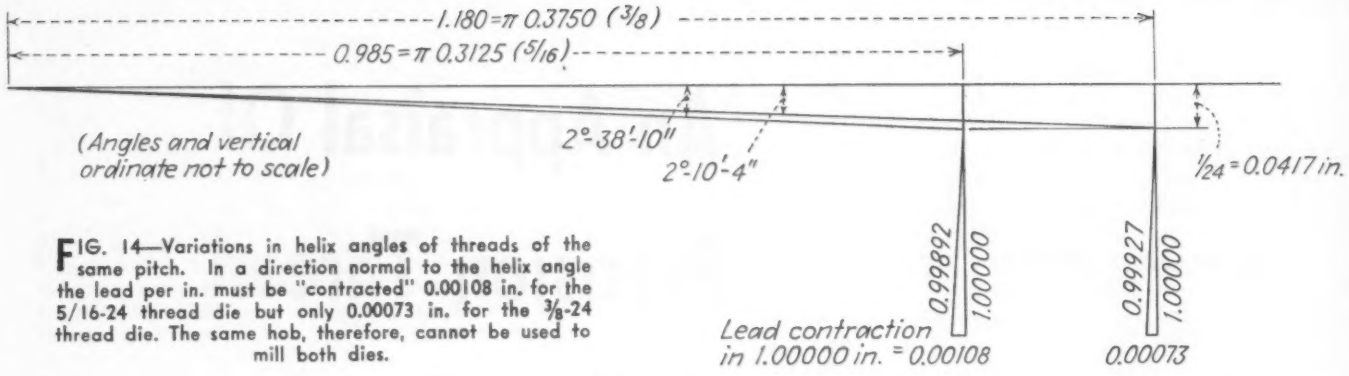


FIG. 14—Variations in helix angles of threads of the same pitch. In a direction normal to the helix angle the lead per in. must be "contracted" 0.00108 in. for the 5/16-24 thread die but only 0.00073 in. for the 3/8-24 thread die. The same hob, therefore, cannot be used to mill both dies.

that in milling thread rolling dies there are two important factors to be taken into account; one, the pitch between the threads or lead, and the other, the helix angle of the thread. For example, in 5/16 in. 24 th. AN fine series thread, Class 2 fit, the thread incline on the die is 2 deg., 38 min., 10 sec. For ⅜ in. 24 th. AN fine series, on the other hand, the thread incline on the die or helix angle is 2 deg., 10 min., 4 sec. (See Fig. 14.) Similar variations are found between 7/16 in. 20 th. screw and a ½ in. 20 th. screw, the corresponding angles of which are 2 deg., 14 min., 2 sec. and 1 deg., 56 min., 18 sec.

Corrections Made for Accuracy

Unlike a gear cutting hob which has to have the rack tooth angles modified in the plane of the cutting edges due to the fairly substantial helix angles encountered, the amount of correction needed in the angle of a thread rolling die to compensate for helix angle is usually less than 15 sec. and hence smaller than commercial tolerances. Such corrections are made only when the highest accuracy is required. Of considerably greater importance, however, is the effect of the helix angle on the lead of the threaded product. Although neither the straight die nor its corresponding milling cutter has lead in the ordinary sense, lead error can be thought of as the summation of pitch errors in 1 in. In the example illustrated in Fig. 14, the lead for the cutter for producing an accurate 5/16-24 die should be contracted 0.00108 in. in 1 in. (The calculation for this contraction can be worked out with six place tables of trigonometric functions simply by substracting the cosine of the helix angle from unit. Stated otherwise, the die and cutter will have 24 th. in. 1 in. x cos 2 deg., 38 min., 10 sec. = 0.99892 in. instead of in 1.00000 in.) Similarly the contraction for a ⅜-24 die should be 0.00073 in. per in. Thus a cutter suitable for a 5/16-24 thread die if used in milling a ⅜-24 thread die would produce a die with a 0.00035 in. error in lead, which is beyond the range of aircraft tolerances. This error is even greater when comparing cutters for ¼-20 coarse thread and ½-20 fine thread screws—as much as 0.002 in.

Hence for precision work a different size milling cutter would have to be used to cut a thread of different helix angle although it might have the same pitch.

Although the thread angle is nominally 60 deg., in actual practice this angle is more nearly 59½ to 59¾ deg. in order to aid the cold flowing of the metal along the flanks of the die.

Standard Flat Die

By far the commonest type of thread rolling die used in reciprocating type machines for commercial or precision work is a die with straight surfaces, with a certain amount of relief at the starting and finishing end of the fixed die. Some relief at the starting end is obviously needed in order to permit the blank to get started into the space between fixed and moving die. An exception in this connection is the rolling of Dardelett threads where dies with zero relief have been successfully employed. The conventional type of design is sketched in Fig. 15. Relief is required at the end of the fixed die in order that a sharp line of demarcation be avoided when the thread drops clear of the dies at the end of the stroke. Otherwise the die would leave its "teeth marks" along the length of the threaded section.

The relief is usually hobbed in the die but reference to Fig. 16 will indicate that as normally hobbed the relief surface will "break" on the line AB that is perpendicular to the helix angle of the thread groove. It is necessary to modify the milled relief in order to bring the break line in a vertical plane AB' corresponding to the axis of the product being rolled. This is done with the aid of a tilting fixture in the miller. In general the amount of entrant relief used on flat dies may run up to 50 or 60 per cent of the total depth of the thread.

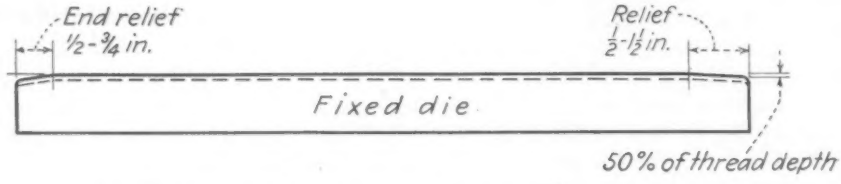


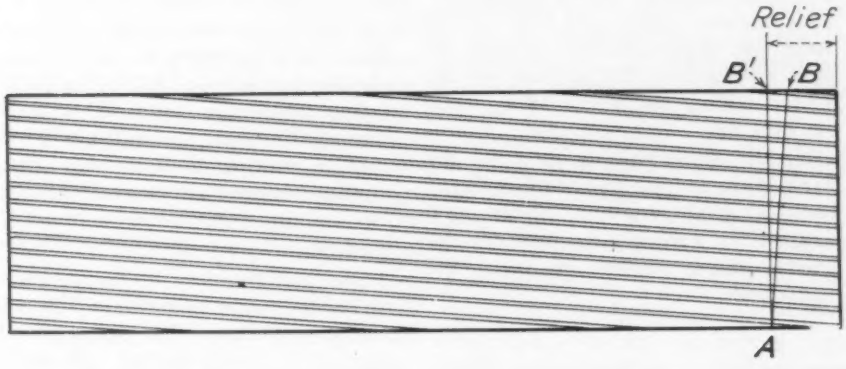
Fig. 15—Characteristics of a conventional straight thread rolling die.

In reciprocating type machines of the rigid type where spring in the frame is avoided, instead of setting the fixed die at a slight angle with respect to the moving die and allowing the deflection in the machine frame partly to take care of the lateral "infeed," what might be termed a lead-in angle is deliberately milled into the die. This is sketched in Fig. 17. It will be noted that the starting end of the fixed die has a small radius, the dimension of which is critical and can only be determined by cut-and-try methods, using hand stoning to produce the final effect. The lead-in angle is roughly two-thirds the length of the die. From that point on is the flat section together with the conventional back end or heel relief to avoid leaving a tool mark down the axis of the screw, noted previously.

Because of the variations in helix angle and pitch, over a period of years

flat die manufacturers have accumulated a tremendous collection of off-size milling hobs corresponding to various helix angles, thread pitches and contractions of lead. In this regard a further complication has been found recently in the rolling of high tensile aircraft studs. In one instance a flat die that had checked perfectly on a soft steel test blank, rolled a thread with an appreciable lead error in the hard, high tensile material. The only conclusion was that there was a certain amount of "springback" in the material being worked. Hence its elastic limit was not exceeded in an endwise direction although stresses had been built up sufficient to cold form the roots and crests of the thread. With heat-treated materials, the spread between the elastic limit and the ultimate strength is obviously narrowed. Within this band of stress, cold working must be performed. In this case it was necessary to modify the pitch of the thread so that when finally rolled the lead "was on the button."

FIG. 16—As ordinarily milled, the relief on the starting end of the fixed die would break along the line AB normal to the thread grooves. For precision work, the break must be along the line AB', parallel to the work axis. This modification is made by tilting the die a small amount on its back face when milling the relief.



Lapped Dies

Thus far the discussion has been limited to milled dies. For many years this was the only way of producing thread rolling dies. More recently, after the dies are hardened, they are lapped to a fine finish, although this is a controversial point. One of the largest producers of aircraft studs insists that necessary tolerances for commercial work can be maintained by using Class A ground hobs for the milling operation and controlling heat-treat distortion by proper technique and precise cycle control. Selected dies made in this manner have been used for precision work. This same firm grinds all its precision dies after heat treatment, but does not lap them. Too smooth a finish is considered detrimental.

Another die maker insists that lapping, if done at all, should be done by hand alongside the thread rolling machine on which it is to be used. The object here is to establish final accuracy by the cut-and-try method, checking pitch error and the form in the blank as it leaves the machine.

One of the largest rolled thread die manufacturers in the country has devised a special machine for lapping milled dies after hardening and also lapping dies that have been ground out of the solid. A cast iron lap with abrasives suspended in light oil is used. Provision is made for tilting the dies at an angle to lap the entrant angles at toe and heel.

The argument in favor of dies that are ground from the solid is that there is often excessive decarburization in the surface of hobbed dies after hardening. This is largely overcome by the proper selection of tool steel and the use of controlled atmospheric furnaces. Contrariwise, it is also pointed out by some that in grinding it is difficult to avoid burning of the die grooves when the final pass of the wheel is made. Lapping alone removes decarburization, scale and hardening distortion without the danger of burning, proponents of this method point out.

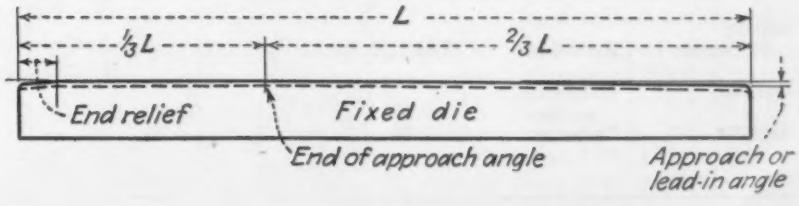
Although it is not the general practice to reclaim dies that have ended their useful life by excessive flaking, recently it has been proposed that dies be reground in steps of 0.010 in. using 0.010 in. shims in mounting to make up for the loss of material. One firm has modified a thread grinder for doing this class of work as well as for grinding straight thread rolling dies out of the solid. In general dies fail by the spalling and breaking down of the thread crests, roughing the minor diameter of the product and making it unusable. Hence some thread die makers advocate removing the entire thread and grinding fresh threads out of the solid in order to remove any fatigue cracks that may extend more than 0.010 in. beneath the surface.

Checking Die Thread Form

After being hardened, ground and/or lapped the dies are very carefully checked by means of lead or sulphur and graphite casts. By means of small dams these casts are accurately alined at right angles to the length of the die and are then viewed under a toolmaker's microscope or projected on an optical comparator. The pitch or lead between the threads may also be checked on a toolmaker's microscope. For precision work the helix angle should correspond to the theoretical within 1 min. of arc. In one die shop, to do this work two dial indicators are set up in a fixture 5 in. apart and the helix angles are calculated by means of trigonometric functions.

In another plant accuracy of the thread form in straight dies is checked by means of wires as shown in Fig. 18. If we assume that a flat die represents a screw of infinite radius in which the pitch diameter becomes a straight line bisecting the space between root and crest, then if wires of proper diameter are chosen the distance between the pitch diameter or line and the crest of the thread form can be checked. The absolute values are of no concern, but the distance from the top of the wires to the top of the crest should not vary

FIG. 17—General proportions of a fixed die in which a lead-in angle or approach action is incorporated. Some of the finest work is being done with this design of die. (Compare with Fig. 15.)



more than 0.0005 in. for a Class 2 thread tolerance. This method gives no check on the bottom half of the thread form. The top half of the die is the more important since it controls the depth of the root below the pitch line of the rolled product. In this particular plant, much less importance is attached to the width of the crests and roots of the die.

Roughening of Dies

Roughening of the starting end of flat dies to provide rolling friction and to prevent skidding of blank and hence mismatching of the thread at the start of the operation is a practice that is occasionally used but one that should be avoided wherever possible, especially in precision rolling. Nevertheless even in precision practice today some dies are roughened by grinding fine grooves crossways of the thread. Others maintain that this type of roughening will leave slightly embossed spots on the threaded product that will not be rolled out unless the die is an extremely long one and provides for eight to ten "contacts" or revolutions of the piece before it is completed. A much better practice is to sandblast or to mudblast the dies at the starting end, Fig. 19. It has also been suggested that dies may be roughened by etching in acid provided that the die is heated in oil to at least 350 deg. F. after etching in order to avoid hydrogen embrittlement.

Just as important as roughing the die is the precise timing of the pusher member which projects the blank in between the dies the instant they are properly registered. On straight type reciprocating machines it is possible to provide the moving ram with a stop finger against which the bolts or studs are placed. This arrangement is shown in Fig. 20. Care should be taken to see that it holds the blank perfectly square with the sides of the die. The starter finger should also have its end ground so that it will hold the blank firmly against the stop and against the moving die for a brief instant while it is being started into the stationary die. Thereafter the blank rolls away from the fixed stop, forcing the starter finger back a small fraction of an inch against its spring. As soon as the starter finger strikes its stop, the blank rolls clear.

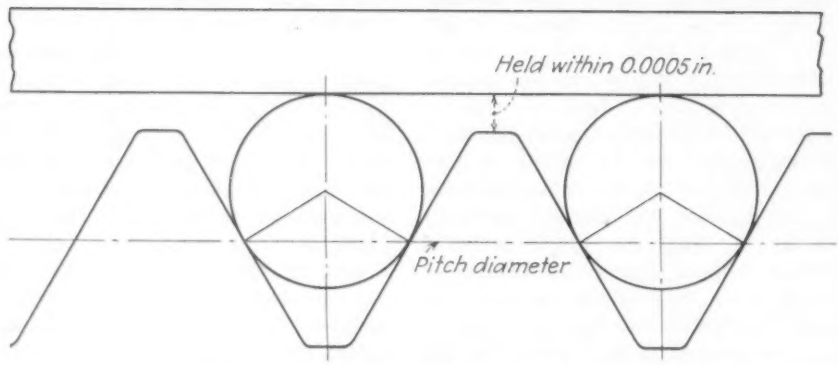


FIG. 18—In checking the accuracy of the thread form in straight dies by p.d. wires, the critical dimension is the distance between the top of the wires and the crest of the thread.

Flat Die Steels

One of the most important factors in selecting a steel for flat thread rolling dies is that it should have very little size change during heat treatment. Other factors include abrasive resistance, toughness and ease of machining. Since in most cases, the threads on the dies are produced with thread milling hobs, machinability is of considerable importance because of the expensive Class A hobs employed. More recently, ease of grinding has also become a factor because grinding either from the solid or a milled thread after heat treatment is widely used in making precision dies. Some of these factors are mutually contradictory, so a compromise must be reached.

For many years ordinary carbon tool steels were used for commercial flat dies because the material was cheap and readily milled. Distortion in subsequent heat treatment in this water hardening material was no problem with the tolerances encountered in "hardware store" bolts. With the demand for Class 3 and 4 rolled threads in hard materials, however, it became necessary to go to high alloy steels that would stand up against the terrific unit pressures involved in cold forming material of 125,000 to 145,000 lb. tensile strength. Crumbling of thread crests in carbon tool steel had to be avoided. Resistance to abrasion was also important.

The obvious answer seemed to be to go to high speed steel and some dies were made of this material. A limited percentage of H.S.S. dies are being used today, both 18-4-1, 18-4-2 and the new molybdenum types like 6-6. This material is especially useful when ground thread dies are involved, because according to some, it is easier to grind high speed without softening. The chief drawbacks seem to be that the material is difficult to

TABLE I

Comparable High Carbon, High Chrome Oil and Air Hardening Tool Steels

Trade Name	Manufacturer	Alloy Content, Per Cent				
		C	Cr	V	Mo	Other
Airdi 150	Crucible	1.50	11.50	0.20	0.80	.....
Cobalt Chrome	Latrobe	1.35	12.12	....	0.64	Co 3.04 Mn 0.25 Si 0.50
Cromovan	Firth-Sterling	1.60	12.00	1.00	0.80	.....
Diamond	Midvale	1.75	18.00	....	....	.....
Ohio Die	Vanadium-Alloys	1.55	12.00	0.80	0.80	Co 0.40 Mn 0.25 Si 0.38
G.S.N. Special	Latrobe	1.52	11.48	0.28	0.74	Mn 0.30 Si 0.30
Lehigh H Temper	Bethlehem	1.60/1.70	11–12	0.30/0.45	....	Mn 0.30/0.50 Si 0.30/0.50
Ontario	Allegheny-Ludlum	1.50	12.00	0.25	0.80	.....
No. 610	Carpenter	1.50	12.00	0.25	0.80	.....

mill to a good surface. It tends to warp in hardening and to decarburize on the surface unless hardening is carefully done in controlled atmosphere furnaces or in salt baths. Some say it will not "stay put," that the material tends to expand—a trouble that might be overcome by cold treatment. Besides, high speed steel is high in cost. It is still considered the best material for thread rolling stainless steel, although at least one big user continues to use carbon steel dies for this purpose. Also one of the biggest producers of aircraft bolts and screws favors high speed steel for rolling material averaging 30 R_c in hardness.

High Carbon, High Chrome

The second class of steel to be tried out on high strength aircraft studs was the high carbon, high chrome steels listed in Table I. Today, they are the most widely used. This material, heat treated to a hardness of 62-63 R_c, has excellent abrasion resistance and the fact that it can be either air hardened or oil quenched makes it desirable from the point of view of minimum distortion. A big aircraft stud producer says it has less flaking tendencies than high speed steel. Its chief drawbacks are that the high alloy content makes it difficult to machine and also difficult to grind without "burning." Steels of this type are being successfully ground, however, although a company about to announce a die grinding and regrinding service indicates that it has not been able as yet to grind this material in an "economical manner."

Particularly for heat treated stud stock, the high carbon, high chromium steels are presently being replaced by steels of lower carbon (1 per cent) and lower chromium (5 per cent) content listed in Table II. These grades can be hardened in still air which is a decided advantage in maintaining straightness in flat dies of any length. Very little finishing is needed in the dies after heat treatment. They machine much more readily than the high carbon, high chrome types, while their performance in service is equal to and often times better than the latter because of their greater toughness and comparatively good resistance to wear. They can also be ground to better advantage. Die costs are obviously lowered by the lower alloy content.

One tool steel supplier states that while this grade will not have greater resistance to wear than the high carbon, high chrome steels or 18-4-1 high speed steel, it does have a marked advantage in machining, can be hardened from a lower temperature and in general is a much more practical steel regardless of its slightly shorter life.

Hardening Practice

In hardening the dies, it is quite important that no carburizing or decarburizing takes place; otherwise, roughing or cracking of the top of the threads is likely to occur after a short run. Hence both grades of carbon chromium tool steels are usually hardened in a controlled atmosphere furnace or are pack hardened when the former equipment is not available. Spent charcoal free from dust or spent pitch coke of 6 to 8 mesh size make desirable packing mediums. The high carbon, high chrome type is usually hardened at 1800-1850 deg. F. and the lower alloy type at 1750-1800 deg. The drawing temperature for both grades is 425-450 deg. to attain a hardness of 61-62 R_c. The only exception is the 18 per cent chromium. Diamond Brand steel (Table I) which is oil quenched from 1750-1825 deg. and drawn at 900 deg. Cyclops Sparta is tempered over a range from 250 to 900 deg. after air cooling.

Still another group of steels which have been used for flat rolling dies are those containing 1¼ to 2 per cent manganese and much lesser amounts of chromium, listed in Table III. These include both oil hardening and air hardening types like Vulcan Vairloy which is exceptional in that it can be hardened from a comparatively low temperature (1500 to 1600 deg. F.). Although its wear resistance is not as good as high carbon, high chrome steel, it is tougher and hence

TABLE II

Comparable Air Hardening Non-Deforming Tool Steels

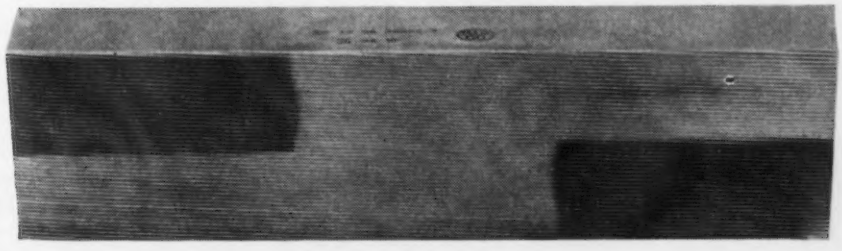
Trade Name	Manufacturer	Alloy Content, Per Cent					
		C	Cr	Va	Mo	Mn	Other
Air Hard	Vanadium-Alloys	1.00	5.25	0.25	1.10	0.70	Si 0.30
Airkool	Crucible	1.00	5.25	0.40	1.15	....	.....
Sagamore	Allegheny-Ludlum	1.00	5.00	0.25	1.00	....	.....
Select B	Latrobe	1.00	5.25	0.25	1.10	0.70	Si 0.30
Sparta	Universal-Cyclops	1.00	5.25	0.25	1.10	0.60	Si 0.20
No. 484	Carpenter	0.95	5.00	0.20	1.00	0.70	.....

TABLE III

Low Alloy Oil Hardening Manganese Tool Steels

Trade Name	Manufacturer	Alloy Content, Per Cent				
		C	Cr	Mn	Si	Other
Colonial No. 6	Vanadium-Alloys	0.95	0.50	1.20	0.30	W 0.60 Va 0.20
Mangano	Latrobe	0.94	0.18	1.55	0.32	.....
Mangano Special	Latrobe	0.92	0.44	1.23	0.33	W 0.57
Presto	Carpenter	1.00/1.05	1.40/1.50	1.50	....	.....
Oil Hardening	Vulcan-Crucible	0.90	0.20 opt.	1.55	....	Va 0.25 opt.
Oil Hardening	Vulcan-Crucible	0.90	0.50	1.20	....	W 0.50
Vairloy	Vulcan-Crucible	1.00	1.00	2.00	....	Mo 1.00

Fig. 19—Die properly roughened by light sandblasting at the starting ends.



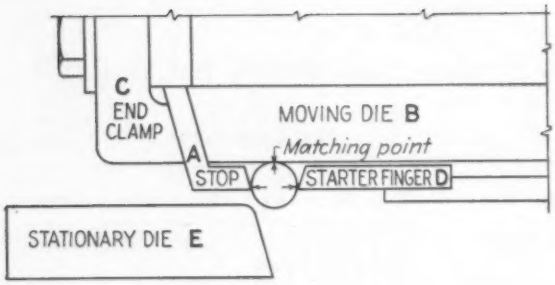


FIG. 20—In precision work where it is essential that the blanks be started absolutely straight at the exact point of die match, a stop (A) is being employed successfully by many users.

the thread form is less likely to spall or crumble in service. It is obviously much easier to handle in heat treating. Such steels as these cost approximately half as much as high carbon high chrome. They are being used for smaller size dies where there is danger of chipping the threads along the edges of the die.

Lower carbon chisel steel containing about 0.55 per cent carbon and 2 per cent tungsten perform well for thread rolling but require a special surface treatment to obtain the necessary surface hardness.

In general, if thread rolling dies are ground after heat treatment, it is extremely important that grinding be done properly as softness may be developed on the die threads if excessive heat is generated in the operation. This is especially true of those steels containing the lesser amounts of alloying elements, such as the oil hardening types. The same types of wheels are used as for thread grinding hardened screws, namely a vitrified wheel of fine grit and soft grade. The grade becomes harder as the grit becomes smaller and the wheel is run at higher speed. For flat dies, work is usually done on a surface grinder.

While the majority of dies for the Reed machine have been made of high speed steel, a number of sets have also been made of both 12 per cent and 5 per cent chromium grades of high carbon, high chrome die steels. The choice of high speed steel is governed by the fact that it is easier to grind and the fact that while high speed steel is often no better than some other tool steels for cold working applications, it is almost always as good.

For the Watson-Flagg cylindrical dies, it has been found that an air hardening tool steel is preferred, such as one containing 1 per cent carbon and 5.25 per cent chromium with some vanadium and molybdenum. While these dies are now being ground out of the solid on a tread grinder, precision threads have been rolled in Europe on such two-roll machines with dies that have been milled or carefully turned in a lathe. These dies are not lapped.

Die hardness is somewhat of a controversial subject. On flat dies it may range all the way from 57 to 64 R_c. In general, for thread rolling the real hard materials, dies are kept below 62 R_c in order to avoid excessive chipping. Some users even specify hardnesses as low as 56 R_c in order to prevent fractures, particularly on the outside threads of the die, Fig. 21.

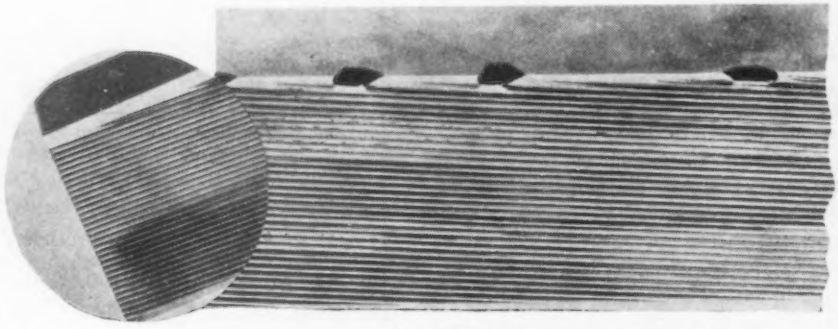


FIG. 21—Failure at the edge threads of a flat die is frequently due to the presence of a radius under the head of the bolt. It can be minimized by beveling the edge as shown in the inset.

However, if the design of the threaded product permits, beveling of the edge of the die will overcome this type of failure to a large extent.

(In the third and concluding article to follow, the important factor of control of blank diameter will be taken up, as well as a graphical analysis of thread failures.)

High Speed X-Ray Camera Benefits Ballistics

PHOTOGRAPHS made at the Army's Frankford Arsenal in Philadelphia with a quick acting X-ray tube show that a high explosive shell inflates to twice its normal diameter before it appears to burst and that the blast accompanying the firing of a rifle bullet sometimes reaches the muzzle before the bullet.

According to Dr. Charles M. Slack, assistant director of the Westinghouse Lamp Division at Bloomfield, N. J., who introduced the new tube to the National Electronics Conference held at Chicago in October, ultra high speed X-raying is the only adequate method of determining how a bullet or shell behaves as it hurtles down the bore of a gun or as it strikes the target. Photographs can even be made to observe the re-alignment which goes on inside a bullet as it passes through the bore. Studies made possible by high speed X-ray photographs have been of inestimable value at arsenals and proving grounds in this country and Great Britain.

The tube requires a sudden burst of 600,000 kw. of electricity to make exposures of a millionth of a second. It is especially designed to draw the electrons out of a cold metal cathode when a high momentary voltage is applied.

Discussing possible non-military uses, Dr. Slack pointed out that high speed X-ray photography will be helpful in inspecting metal parts on a speedy conveyor belt, and in studying the rapid metallurgical changes which take place during arc welding operations. With the help of the high speed X-ray camera it will no longer be necessary to wait until rapidly moving machine parts break down to see what causes wear and failure.

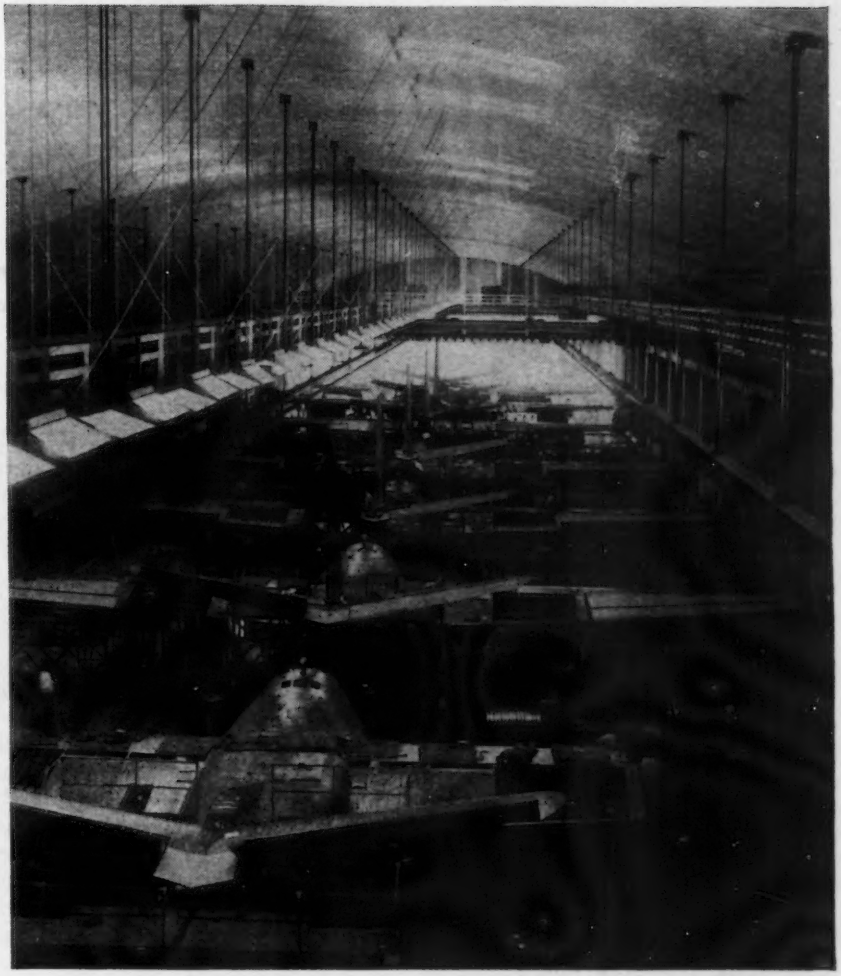
Indirect Lighting System Provides 35 Ft. Candles

A NEW industrial lighting method born of wartime production demands will lower the cost of peacetime goods, John L. Kilpatrick, Westinghouse lighting specialist, predicted in a paper presented at the 37th annual technical conference of the Illuminating Engineering Society. Presented jointly with L. N. Blugerman, plant engineer at the new Budd plant, Bustleton, Pa., the paper described successful completion of the first year of lighting of the Budd plant's arched roof bays, which Mr. Kilpatrick characterized as "tunnels of shadowless light totaling nearly 3 miles in length." The bays are illuminated by a new system of high-intensity indirect mercury vapor lighting.

The new plant, built by the Defense Plant Corp. and operated by the Edward G. Budd Mfg. Co., consists of eight all-white concrete bays, or aisles, each with an arched roof. It was designed for assembly line production of aircraft.

Westinghouse and Budd engineers cooperated in the development of this new type of indirect lighting system which, taking advantage of the arched-roof construction, is designed to exclude direct and reflected glare, minimize heat radiation and shadow areas, and to provide well diffused illumination with easy and low-cost maintenance.

In each bay, shadows have been eliminated by directing the inverted lights upward against a highly reflective, curved white ceiling, instead of downward in the conventional manner. The reflector-like ceilings completely diffuse the light, throwing it even under large objects close to the floor, Mr. Kilpatrick said.



THE curved white ceiling of this factory reflects a soft, well-diffused illumination to all parts of the airplane assembly line below. This new system of high intensity indirect mercury vapor lighting was supplied by Westinghouse for the new Budd plant at Bustleton, Pa. Reflectors containing the mercury lamps are suspended from each side of a catwalk (left) hanging from the ceiling.

Soft Illumination

The paper presented by the two engineers pointed out that the result of the new system is 35 foot-candles of soft illumination throughout the working area of the factory. All necessity for eye-strain from the glare of extension lamps is eliminated.

Mr. Kilpatrick predicted that the new system, applied to postwar factories, will revolutionize industrial lighting practices and lead to lower-cost mass production of civilian goods by reducing mistakes, streamlining factory designs and speeding up assembly processes.

In the Budd plant, the domed ceiling, the walls and to a limited degree even the floor of the factory are utilized to reflect and diffuse the light from a twin row of indirect fixtures mounted on a catwalk suspended down the center of each main factory aisle or bay. Servicing is done from the catwalk.

The major source of the light is the new 3000-watt mercury vapor lamp, which is used in conjunction with alternate groups of four 750-watt incandescent lamps to obtain a modified color correction, since incandescent light contains rays from the red end of the color spectrum that mercury vapor light lacks.

Before the new 3000-watt lamps were available, glareless and shadowless indirect lighting of such intensity was not practical. There was no source of light sufficiently concentrated to provide this level and quality of illumination without using an enormous number of fixtures. The new mercury lamps produce many times more light per watt than other light sources in general industrial use, and therefore take much less space and simplify the wiring system.

Proper light is particularly difficult to obtain in aircraft factories, because the huge wings of the planes on the assembly line cast so much shadow. Because the indirect light source is so intense and concentrated, and all the inside surfaces of the factory are good reflectors the light reflects from surface to surface. Thus it not only fills the whole factory but in this plant is carried under the wings and fuselages of the airplanes so that it literally erases shadows.

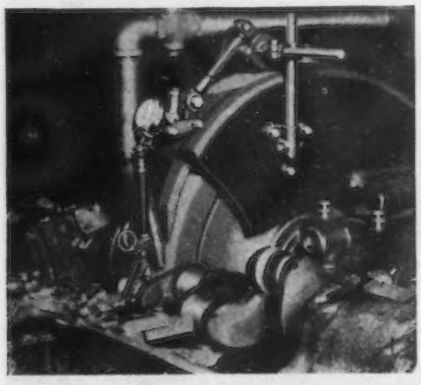
In addition to a 50 per cent saving in material compared to any other practical lighting system, the new shadowless system, the first time indirect lighting has been applied to a factory on such a large scale, proved to be the least expensive to install.

New Equipment . . .

Small Tools

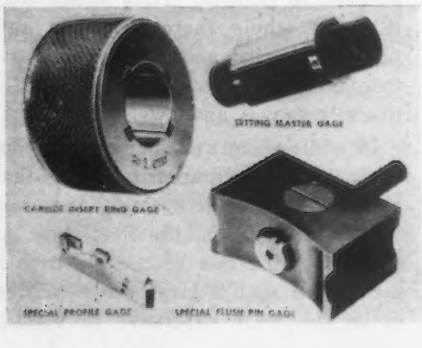
. . . Recent developments in gages, holding fixtures, fastening devices and other small tools are described in the following pages.

A PRATT grinding gage which continuously measures the diameter of external cylindrical jobs while work is in progress and automatically indicates the point at which the correct diameter is reached has been announced by *American Diamond Tool & Gage Co.*, 7523 Fenkel Avenue, Detroit 21. The gage is said to provide a continuous visible check on out of roundness and the amount of error. The gage is adapted both to straight and tapered work. Work is automatically measured while stock is being removed.



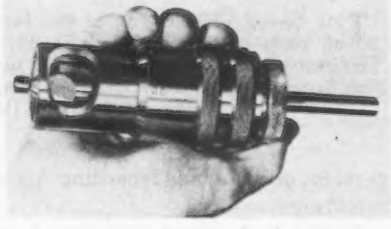
Fixed Gages

A LINE of precision gages to meet standard or special requirements has been announced by the *Crescent Tool & Die Co.*, 1469 Electric Avenue, Lincoln Park, Mich. Plug, ring flat plug, profile, flush pin, snap and build-up gages are available in a full range of standard sizes and tolerances. Standard gages are built to American Gage Design Committee specifications. Special gages are manufactured to purchaser's blueprints. The gages are offered in steel, chromium plate or carbide with chromium plate and carbide designed especially for long production runs and for use with highly abrasive materials.



Micrometer Stop Countersink

FOR precision countersinking of large rivets, bolts and screws, the *Aero Tool Co.*, Burbank, Cal., has developed a large size micrometer stop countersink. This tool countersinks up to 1¼ in. and is capable of countersinking ½ in. rivets. It can be instantly and positively locked at each micrometer setting in increments of 0.001 in. Adjustments are made manually and can be made while the tool is in operation. Standard countersink includes precision ground interchangeable 1 in. diameter cutter, available in 72, 78, 82, 100, 110, and 115 deg. angles with or without integral pilot.

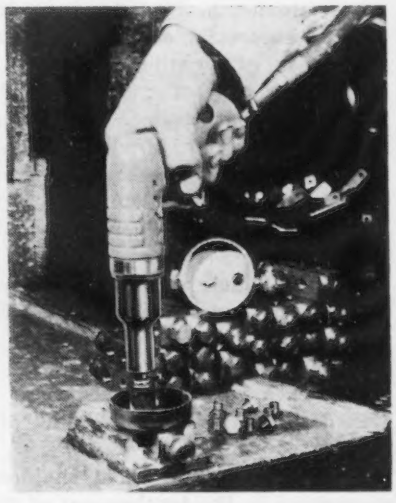


Wire Cutter

A CUTTER, called the Alpert Lil' Giant cutter, designed to cut up to ¼ in bolts or wires and ⅜ in. stranded cable has been announced by *Techtmann Industries, Inc.*, 828 North Broadway, Milwaukee. The cutter handles are supplied with or without insulation as desired. Cutting blades are replaceable and both blades may be removed by turning off a screw and nut. A small cam permits adjustment for wear allowance for dulled edges.

Screw Drivers and Nut Setters

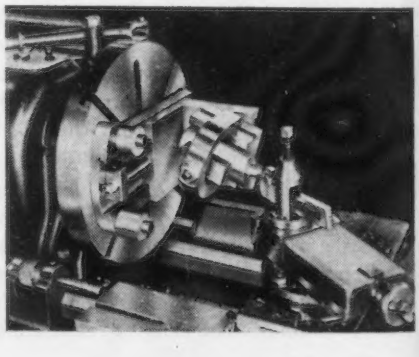
A LINE of impact screw drivers and nut setters with positive torque control has been announced by *Aro Equipment Corp.*, Bryan, Ohio. Pneumatically powered, the tool operates with a roller clutch impact mechanism having only four major parts



—anvil, hammer and two cylindrical steel rollers. When in operation, the centrifugal force throws the two steel rollers out against the hammer which transfers the full torque to the work in the form of a sudden impact. When the selected torque is obtained the rollers rebound from the anvil face and do not allow the hammer to engage for impact.

Lathe Angle Plate

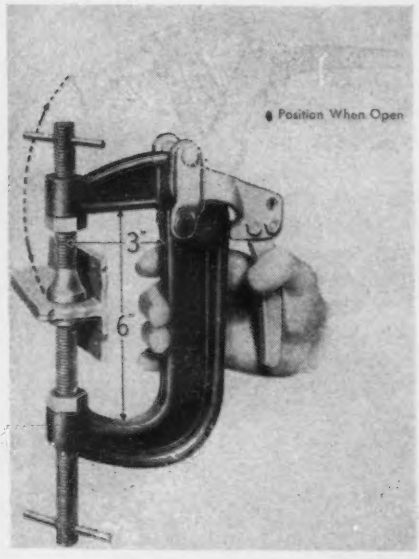
A LATHE angle plate with accessories needed to machine intricate jobs like radius turning, cutting eccentrics, angle boring, turning compound angles, etc., has been announced by *Best Tools Corp.*, 482 Sunrise Highway, Rockville Centre, Long Is-



land, N. Y. Known as the No. 51, the lathe plate attachment is positioned by a locating nose plus in the headstock spindle and is bolted to the faceplate. It is equipped with an adjusting screw and the necessary gages so that by the use of the size blocks or calipers work may be located with a high degree of accuracy. It is especially adapted to jig and fixture work where holes, straight or directional, must be held and spaced to close tolerances. The accessories Nos. 51-A, 51-B and 51-C are the clamps to hold various shapes of stock. However, the clamping accessory regularly furnished with No. 61 is a straight adjustable clamping saddle suited to hold straight stock.

Toggle-Action C-Clamp

AN improved toggle-action C-clamp which securely holds a wide range of work has been developed by *Detroit Stamping Co.*, 345 Midland



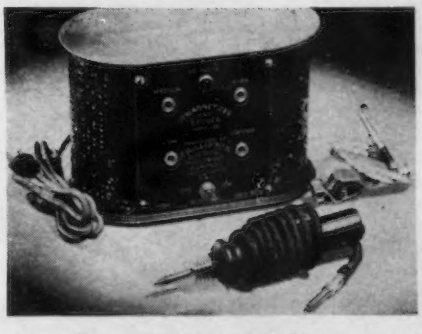
Avenue, Detroit 3. Two adjustable clamping spindles grip the work at any selected point, permitting clamping over double angles and other irregular shapes. The clamping edge is readily adjustable to any thickness within the clamp range. Each spindle is locked into its place and remains at that exact setting until manually readjusted. The threaded spindles are copper coated against welding spatter. Links and handle are plated against corrosion.

Angle Tool Attachment

AN angle tool attachment, the boiler tube expander driver, for getting at hard to reach spots has been announced by *Invincible Tool Co.*, Empire Building, Pittsburgh 22. Made in two standard sizes with ¾ and ½ in. square driving chuck, the expander-drivers work in right or left hand corners. All thrust action is taken directly on ball thrust bearings allowing instant reversal of driving direction. Built for heavy duty service, they can be used to run on or off nuts, studs and bolts in tight spaces and are obtainable in square or hexagon spindles and square, hexagon or Morse taper shanks.

Blind Rivet

A BLIND rivet and a hand gun used for driving the rivet has been announced by *Huck Mfg. Co.*, 2480 Bellevue Avenue, Detroit 7. The rivet is of a universal type in that one grip length will suffice for any combination of sheet thicknesses from 0.050 to 0.300 in. A small hand gun, weighing less than 2 lb. and capable of exerting a pulling force of 1000 lb. has been developed. The hand gun which is especially designed for field repairs will drive ⅛, 5/32 and 3/16 in. diameter rivets in either brazier or countersunk types without any change or additional accessories.



Demagnetizer and Etcher

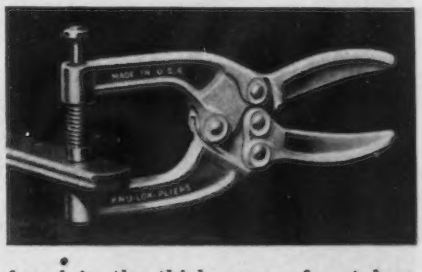
AN improved portable type of demagnetizer and etcher has been announced by *Frampton Electrical Equipment Co.*, 230 Hickory Street, Dayton 10. The unit weighs only 16 lb. Parts to be demagnetized are simply passed across the poles or, if they are large and heavy, the demagnetizer is simply moved across their surfaces. Etching is performed by plugging the etching pencil into one of three jacks marked "Low," "Medium" and "High" depending on the wattage to be used. Metals of any thickness can be etched. The unit is designed for use with 110-volt, 60-cycle, single phase circuit.

Locknut

A LOCKNUT with a triple grip, the Palnut 6NAO, has been developed by *Palnut Co.*, 63 Cordier Street, Irvington, N. J. Besides the regular double locking action found in all Palnuts, a third grip is exerted on the bolt by the top portion of the nut. The sides have been extended up and in. The ends of the "petals" are turned in as illustrated, leaving a hole in the top slightly smaller in diameter than the outside diameter of the bolt. When the bolt extends through the top of the Palnut, it forces the top open so that a strong spring pressure is exerted on the bolt, giving the nut its triple grip.

Clamping Pliers

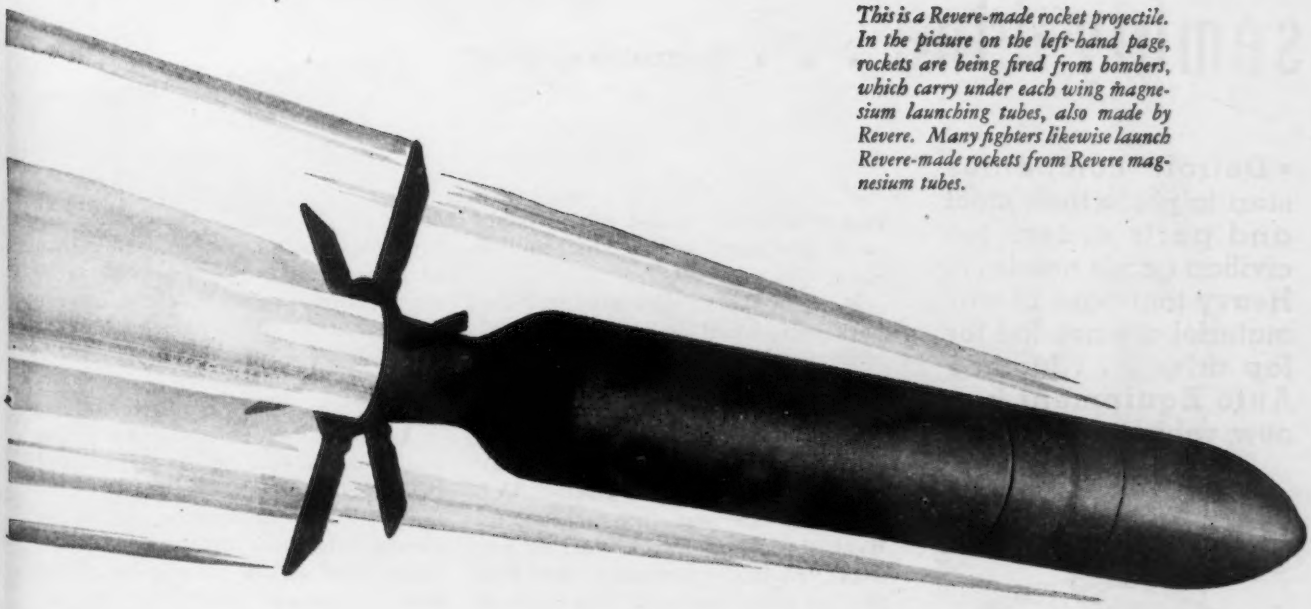
AN improved plier, Vari-Grip with a selfsetting pressure spindle to compensate for any variations



found in the thicknesses of metal or parts clamped has been announced by *Knu-Vise, Inc.*, Detroit. The plier will compensate for differences in thickness that may vary up to ⅜ in. The Vari-Grip is 8 in. long and weighs 22 oz. Its throat capacity is 0 to ⅜ in.; depth is 2⅝ in.

Thread Slide Rule

A THREAD slide rule consisting of a pocket and a slide of Bristol board on which is printed all specifications for screw and nut for classes 1, 2, 3 and 4 fine and coarse threads has been announced by *S. & B. Engineering Co.*, 507 N. St. Clair Street, Pittsburgh. As the slide is moved, a slot in the pocket exposes readings for any desired size screw. Tables on the pocket make it easy to obtain readings to fit special thread dimensions and tolerances and for special screw sizes. All computations on the slide are based on National Bureau of Standard's specifications.



This is a Revere-made rocket projectile. In the picture on the left-hand page, rockets are being fired from bombers, which carry under each wing magnesium launching tubes, also made by Revere. Many fighters likewise launch Revere-made rockets from Revere magnesium tubes.

It's GOT to be PERFECT!

Revere has made over two million rocket projectiles out of Revere Electric Welded Steel Tube

Rocket Projectile Facts

Propelling charge is a special powder producing great heat and pressure as it burns.

High-explosive head contains pentolite, 20% more powerful than TNT.

Projectile has the devastating effect of a 105-mm. shell.

Unlike a shell, a rocket is fired without recoil, and hence can be discharged from a plane, from ships too small to carry artillery, or from light launching apparatus used by ground troops.

Rocket projectiles are used to destroy fortifications, tanks, planes, ships, submarines, and against enemy troops, in France, Italy, Russia, and the Pacific.

They are probably the most effective of projectiles per pound and per dollar.

Thus the war comes rocketing to an earlier end!

Look at that rocket projectile streaking through the air faster than the airplane flies!

Think of the terrific heat and pressure required to propel that rocket with such amazing speed and accuracy!

And then remember this:—Revere not only developed those projectiles at Army Ordnance request, but has made over two million rocket projectiles and rocket targets out of Revere Electric Welded Steel Tube.

Any steel tube suitable for such a purpose must be not merely good, but PERFECT. It must pass a pressure test of over 5000 pounds per square inch!

What this means to YOU

It will be great good news to you that today our facilities are so large that we are once again able to fill commercial orders, on a priority basis only.

If you need steel tube for boilers, condensers, water and steam lines, or for general pressure or mechanical applications, consult Revere. We will not only supply high-pressure electric welded steel tube, but will cooperate with you in working out any problems in specifications, selection or installation. Revere has been welding steel tube electrically for 25 years. We *know how*.

May we work with you *now* in formulating your plans for the use of steel tube?

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N.Y.

Picture at left reproduced from original by Robert Lindgren, Art Editor, AIR NEWS, September issue.

Assembly Line . . .

STANLEY H. BRAMS

• Detroit companies start to place their steel and parts orders for civilian goods needs . . . Heavy tonnages of war materiel are needed for Jap drive . . . Monroe Auto Equipment has new vehicle seat.

DETROIT—Postwar steel orders are beginning to be filed in the offices of steel companies in the Detroit area. The orders are of varying degrees of certainty, varying all the way from firm commitments of sizes, shapes and specifications to verbal requests for assurances of places on mill books. They come not only from the automobile industry and its suppliers, but from stove and refrigerator manufacturers and their parts makers, and from other varied categories of producers.

How much tonnage has been placed in this modest wave of ordering, which was largely concentrated during the last half of October, is anybody's guess. Indications are that General Motors may have committed itself for somewhere around 300,000 tons. Evidently there will be further placement of orders, for only a few weeks ago did the company indicate that the total of orders it would activate on go-day would come to 800,000 tons.

Chrysler has notified several steel companies of its intentions to buy tonnage, but until further information is sent along in detail, quantity will not be known. On the basis of the General Motors ordering, however, it would be reasonable to assume that initial Chrysler buying might come between 100,000 and 150,000 tons. The other miscellany which has been rather definitely placed can probably swell the total to the half-million mark.

Many of the orders placed thus far have been based on a week-by-week schedule of deliveries. This pattern is the same as has been employed to order from parts manufacturers, and deserves a bit of explanation—

Quantities are specified for weekly deliveries, with weeks labeled "A," "B," etc. In any such scheduling, Week "A" is the week starting out with "go-day." Generally the first two or three weeks in this sort of scheduling are blank, with deliveries beginning shortly afterwards—within two weeks in a couple of cases, not for two months in others. Of course the ordering from any one manufacturer varies with the product; a purchase of connecting rods, for example, would be needed far ahead of steering wheels.

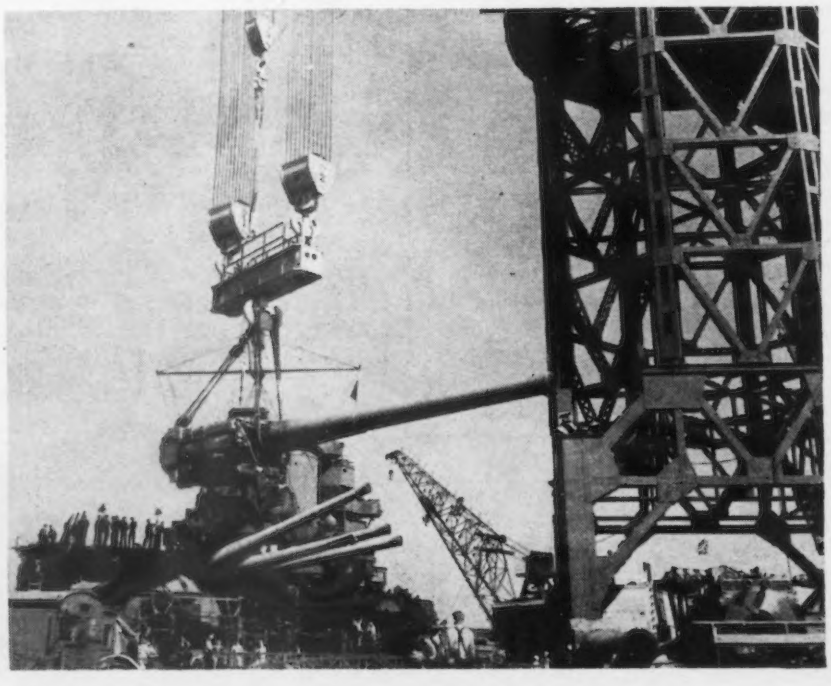
Other ordering has been set up simply by months, with the buys broken down into fairly even fractions for the respective periods, shaded somewhat on the light side during the initial period or two, and heavier than average at the end. Steel for major automotive buyers is ordered for shipment to basic manufacturing plants, of course, well ahead of the time it is marked to move to such points as body plants, where production is fairly close to final assembly.

ARMY materiel requirements in tonnage will possibly be larger per man for landings in Japan and the Asian mainland than they were for the European invasion, due to the greater distances involved and the ruder state of the countryside. That was the message brought to the employees in the War Production Board in a speech by Col. E. L. Cummings, chief engineer of the Office, Chief of Ordnance—Detroit, last week.

For an initial landing of 250,000 troops, from five to ten tons of cargo —equipment and supplies—will be needed for each soldier. This includes 200,000 tons of weapons and ammunition, 325,000 tons of combat vehicles and 525,000 tons of trucks. For replacement during the succeeding 30 days will be required an additional 33,000 tons of weapons and ammunition, 8000 tons of combat vehicles and 5000 tons of trucks.

After beachheads are established

EARNS NEW GUNS: *Their linings worn out by frequent firing, the 14-in. guns of a veteran Navy battleship are replaced by guns with new linings. The immense weight of the gun is supported with majestic ease by the tremendous crane.*



How would YOU plan an "Ideal" Tool Shop?

Suppose you had unlimited funds and facilities at your disposal with instructions to build a complete tool shop "from scratch." How would you plan the building, the office layout . . . what equipment would you select and how would you arrange it? What steps would you take to make sure it would operate at top efficiency and earn a fair profit for you?

The current issue of BACKGROUNDS (Vol. 3, No. 2) a Pratt & Whitney publication, contains a fascinating and highly informative article on this very subject, in which a group of experts have pooled their ideas of the "dream" tool shop. Chances are you will find this article both stimulating and profitable, particularly if you are planning improvements in your own shop, or are contemplating building a new one after the war. The Editor of BACKGROUNDS will be glad to send a copy gratis to interested shop men. Just fill out and mail the coupon at the right.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

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Editor of BACKGROUNDS
Pratt & Whitney
Division Niles-Bement-Pond Company
West Hartford 1, Connecticut

Dear Sir:

I would appreciate a copy of the current issue of BACKGROUNDS containing the article on Tool Shop Planning.

*Name and Title*_____

*Company*_____

*Address*_____

each 100,000 men on shore will need 65,404 tons of shelter construction material, 1433 tons of miscellaneous hardware, 32,238 tons of pipe and fittings, 72,550 tons of railroad equipments, 675 tons of tank-gas storage, 750 tons of hangars, 34,825 tons of airport materials, 14,800 tons of construction material for roads, 4150 tons of bridges, 3280 tons of prefrabricated buildings, 6025 tons of barges and 75 tons of tools. In all, requirements will total 267,260 tons for each 100,000 men, including not only steel needs, but others as well.

At the present time, said Col. Cummings, Army Ordnance has more than 1000 research and development orders placed with industry. The rate of entry of new weapons in the mass production at this time, he revealed, is approximately 30 per month, some of which have already reached battle front, and others of which are just about to receive baptisms of fire.

The main theme of the Cummings talk was the express need for heavy trucks. It is the top priority item of the Army, he said, holding its position with rockets, superbombers, and heavy artillery. To date, he said, the shipments of trucks have been only 60 per cent of the projection for 1944. In this respect, indications are that the Army may not receive any more than 85 per cent of its 1944 expectations.

The week's budget of news included announcement by Monroe Auto Equipment Co. of a new type of seat designed originally for military vehicles, and planned for postwar installation on trucks and, later, passenger cars.

The new seat goes a good way toward taking the bumps out of travel. In simple terms, it adapts the shocks absorber principle to seats, importantly reducing recoil action on bumpy road. Higher costs may constitute a barrier to general adoption in the passenger car field, but in the truck field, where extras may be said to be practically standard, and where driver exhaustion is a factor of note, the new seats could well have good acceptance. Experimental installations for 11 truck producers are now under way, and the tractor field is being eyed.

At the announcement of this device, Monroe let it be known that it has also developed a vertical triple-action hydraulic shock absorber being employed on special Army trucks, providing smoother ride, increasing safety by enlarging control, protecting pay load by reducing jolting, and reducing driver fatigue. Also of interest to automotive people was the statement that the company has designed a new oil pump for cars and trucks, claimed to be 20 per cent cheaper to manufacture than others on the market, and said to have greater capacity at both high and low speeds. The quality of oil pumps, it might be added at this point, is something which will assume greater importance in postwar cars as automatic transmissions of various kinds come into greater vogue.

Machine Tool Civilian Business On 2 to 4 Month Delivery

Rockford, Ill.

• • • Unrated civilian business on the books of representative local machine tool builders varies from 20 to 50 per cent of total backlog of individual companies here.

This compares with an industry-wide ratio at the end of September, as announced by WPB, of $9,298,000 out of a total backlog of $193,682,000, clearly demonstrating the speed with which civilian orders have been placed since restrictions were liberalized.

Tentative deliveries quoted on this unrated business, barring an influx of rated orders, average about four months on standard machine tools. Difficulty in securing critical components, such as motors, may considerably extend this period on some tools, however.

Automotive buying has been heavy. Sales offices report that emphasis placed on specific delivery dates in the early stages of the automotive order influx a few weeks ago has been greatly tempered. Realizing the restrictions imposed by WPB scheduling regulations, buyers with unrated orders now are more interested in what type of orders take precedence over theirs on the books, and sequence of delivery on their own orders. Some rated civilian orders for key machines have been received.

With new military orders tapering off, the unrated bloc is regarded as having a good chance of becoming frozen on the schedules 60 days before projected delivery. In most instances this would take place about January 1. The biggest single threat currently hanging over the completion of these orders is Russian business yet to be confirmed by the Treasury Department, which could cut directly across the 25 per cent of the order board reserved for civilian and lend-lease business. Because of the slackening in military business, it is conceded that the 25 per cent portion guaranteed for this type of business may bulge considerably.

Automotive buying has been principally for individual machines rather than for complete production lines. Most buyers are represented as being interested in securing production as soon as possible, specifying sequence of need for individual machines. Once production is accomplished, more attention is expected to be given to complete new lines.

Production of shell machinery for the heavy artillery ammunition program is in full swing and deliveries should be completed by Feb. 1, barring previous cancellations. A substantial volume of Navy business remains on the books and should continue as projected.

COMING EVENTS

Nov. 9-10—SAE Fuels & Lubricants, national meeting, Tulsa, Okla.

Nov. 9-10—American Zinc Institute, 15th meeting of Galvanizers Committee, Pittsburgh.

Nov. 10-18 — International Business Conference, Rye, N. Y.

Nov. 19—Gulf Coast Chapter, Institute of Scrap Iron & Steel, Inc., annual fall meeting, Dallas, Tex.

Nov. 27-Dec. 2—National Exposition of Power and Mechanical Engineering, New York

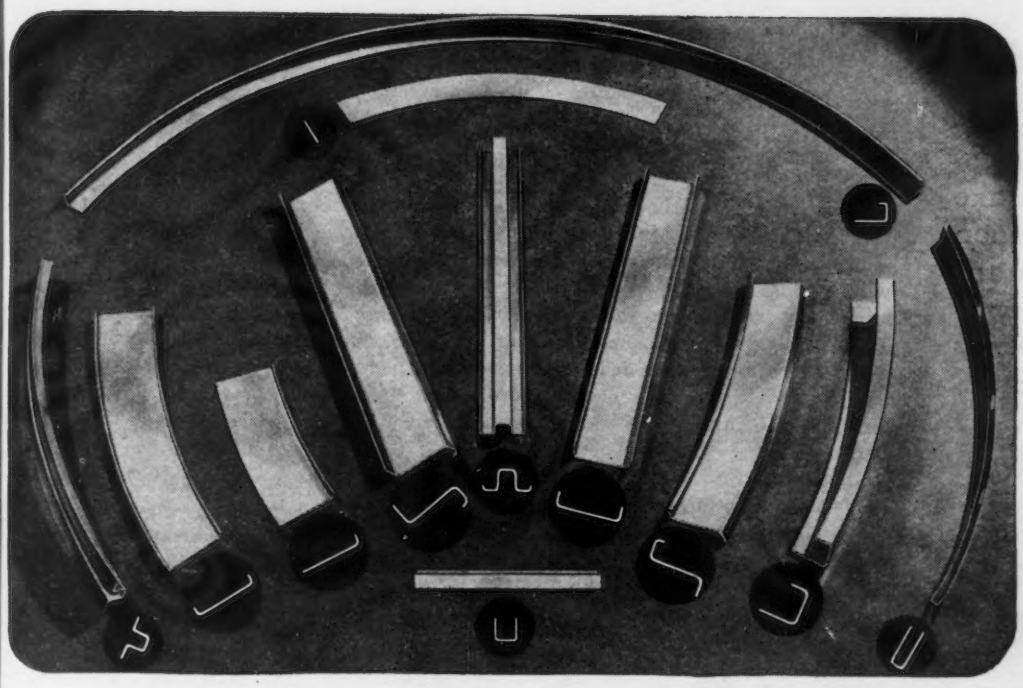
Nov. 29-Dec. 1—American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, technical meeting, Philadelphia.

Dec. 4-6—SAE National air cargo meeting, Chicago.

Dec. 10-13—American Society of Refrigerating Engineers, 40th annual meeting, New York.

Jan. 8-12—SAE Annual Meeting, Detroit.

Jan. 10-11—Institute of Scrap Iron & Steel, Inc., annual meeting, Cincinnati.



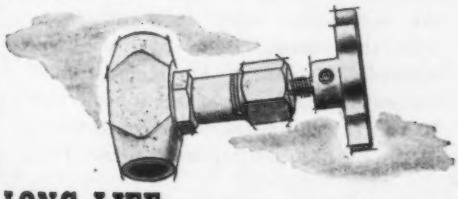
Design Flexibility

These shapes illustrate what you can do with easy-to-fabricate Carpenter Stainless Strip. Lighter gauges and sharper radii are possible with this versatile metal. The life of the product you are designing now can be lengthened, its sales appeal enhanced by making it from bright, uniform Carpenter Stainless Steels.

You get these NEW DESIGN POSSIBILITIES

with Carpenter Stainless Steel

LOW UNIT COST To gain sales appeal yet keep price competitive, kitchen implements, like the egg beater shown above, gain distinct advantages when made from Carpenter Stainless Steel.



LONG LIFE Valves made from Carpenter Stainless provide resistance to corrosion from a wide range of chemicals and withstand heat, pressure and wear.

EYE APPEAL Unusual eye-catching designs captured in sparkling Stainless! It's easy when you specify Carpenter! For this Stainless trim a light gauge was used without sacrifice of strength and rigidity.

That gleam in your designer's eye probably means one thing: you're planning to launch some exciting new or redesigned product in the postwar market.

There are three ways you can benefit by working with Carpenter in your postwar planning:

1. By starting with Carpenter Stainless Steels, which, through rigid control in manufacture, can be counted on to have the same uniform qualities, lot after lot.
2. Through a service program which aims to help Stainless users select the analysis that will best meet the particular fabrication, corrosion, and physical requirements.
3. By taking advantage of Carpenter metallurgical and engineering assistance in solving new and different problems in the use of Stainless Steels. This helps prevent trouble *before it starts*, speeds production, and reduces fabricating costs.

Take the first step to secure this helpful Stainless design-engineering cooperation by calling in your nearby Carpenter representative. Talk over your problems with him—get the benefit of his long Stainless experience. If you have not already received a copy of our 98-page book, "Working Data for Carpenter Stainless Steels", drop us a line on your company letterhead indicating your title.

The Carpenter Steel Company, 121 W. Bern Street, Reading, Pa.

Carpenter STAINLESS STEELS

...for
Strength
Rigidity
Heat Resistance
Corrosion Resistance
Longer Product Life
Sales Appeal

BRANCHES AT
Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

Washington

L. W. MOFFETT

• Congress will make searching investigation of war procurement after the European war ends . . . Army-Navy termination regulation called "humdinger."

WASHINGTON — The election being over, Congress now is awaiting the end of the European war before it begins what are expected to be searching investigations of war procurement. Senatorial committees in particular are reported to have a lot of material which has been suppressed because of the possible effect on the election and upon morale while the nation is engaged in a two-front war.

Then the gloves will be taken off and there is no telling what will develop in a number of important matters affecting industry. Certainly governmental policies which have been in dispute and consequently have not been seriously advanced because of election worries upon the part of the Administration will be dusted off by the Democrats and opposed by the Republicans.

Every effort will be made to prevent a blow-off with the same arguments that have been used, but perhaps it will be psychologically healthy when revelations are made because it will release pent-up feelings of injustice about situations that were wrong and debunk those situations which were merely imaginary.

* * *

The new Army-Navy joint termination regulation has been described as a "humdinger" by trade sources who predict that in this war, as in the last one, all contracts will be settled before Congressional committees can get around to investigating.

It is said that the services have trimmed the job down so that they will not have to concern themselves with but about 20 per cent of terminations, mostly large companies. There are three provisions which fall into this category and deal with settlement of claims of subcontractors, termination inventories and plant clearance.

Subcontractors whose claims are $10,000 or less may be paid off by prime contractors without any review of the transaction by the services if the prime contractor gets the approval of the agency which is responsible for most of the supplier's business.

Thus, if the prime contractor review board has a contract with a supplier and the majority of the supplier's business is with the Army, the prime contractor has only to get the permission of the Army and the rest of the agencies will automatically accept the prime contractor's review of the supplier's claim and his settlement.

At the same time, if a subcontractor's claim is $10,000 or less he may, provided he gets the approval of his consumer which will be granted as a matter of course, dispose of all or any of his termination inventories as he sees fit. This provision while making the services' job easier will practically do away with the function of the newly created Surplus Property Board before it gets a chance to set up business.

Furthermore, this situation of no control over surplus property disposition is aggravated by another provision that lets prime contractors buy material for their own use or for sale, so that billions of dollars' worth of finished products, work in process, and untouched inventories may be thrown on the market without anyone to say no.

JTR says that contracting officers must approve of the price to be charged the contractor or another, and must approve the disposition. But it is not planned to police these contractual agreements and the United States Chamber of Commerce for one organization is extremely worried about the possibility of all sorts of dumping and price structure smashing.

The third provision which has to do with plant clearance says that a contractor who wants to get his plant cleared must file his inventory lists and if the contracting officer has not raised a question about it within 10 days of transmission, the list is automatically valid and incontestible.

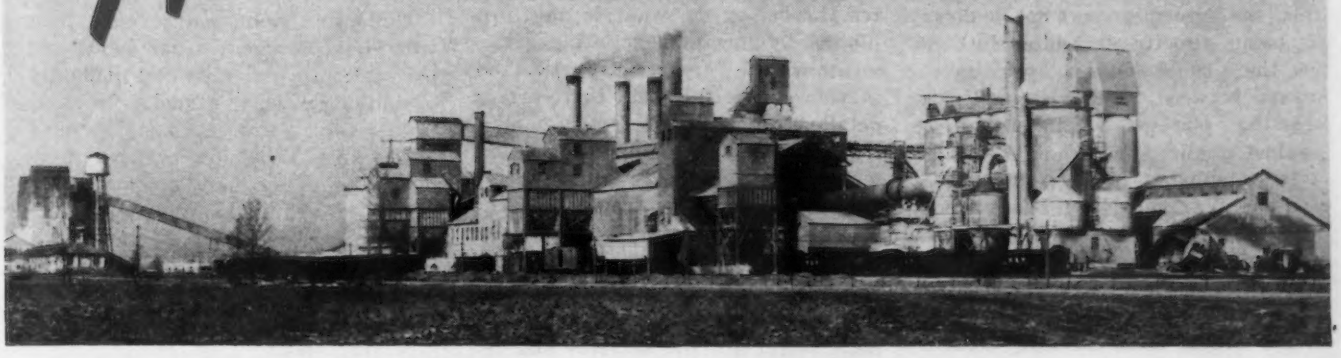
Further, within 20 days from the time the contractor submits his termination list, the particular agency or service involved is supposed to tell the contractor what it wants done with the various items of inventory, whether they are to be sold, retained for government use or scrapped. The 10 and the 20-day periods are all within the 60 days stipulated by the Ter-

---

YANKS PUSH FORWARD: *A General Sherman tank advances through a native-grass hut village on Leyte Island, Philippines, as U. S. troops began the battle to drive the Japs from the American possession. At the left in the background is an "alligator."*

Here's Headquarters

FOR QUALITY REFRACTORIES



Magnefer The popular dead-burned dolomite. Used by the steel industry more than 25 years for basic open hearth and slag line maintenance. Magnefer has won acceptance as a dependable refractory, uniform in grain size and composition. For prompt shipment at all times, ample circulating stock is carried at the Maple Grove, Ohio, plant, located at the geographical center of the industry.

Syndolag A rice-size, dead-burned dolomite, with the same chemical and mineralogical properties as Magnefer, Syndolag is ideal for electric furnace hearth maintenance. Its smaller, sharp-angled grains, carefully proportioned as to sizing, have a steep angle of repose. This enables Syndolag to adhere well to steep banks. Smaller grains absorb heat quickly and consolidate readily in residual furnace heat.

Basifrit The original quick-setting magnesite refractory, for construction and repair of furnace hearths. Recommended especially for resurfacing old hearths, to prolong their useful life. For resurfacing, an old hearth is washed down about 6 inches to provide a sound foundation. Basifrit, burned in very quickly in successive thin applications, provides a clean new bottom, with minimum time lost from production.

Hearth Patch Fine-grained, fast-setting magnesia refractory designed for emergency repair of deep bottom holes in quickest possible manner. After slag and metal are cleaned from a hole, Hearth Patch is dumped into it, and leveled off. Repair is finished by surfacing with a two-inch layer of burned dolomite or magnesite. Patch settles down under operating temperature to become a smooth, long-lasting, dependable repair.

GUNMIX A new series of fine-grained, quick-setting, highly adhesive refractories, designed for rapid emplacement on furnace linings by air stream and water. The Gunmix and Gunmix Gun now available are intended primarily for maintaining hot sidewalls of basic electric steel furnaces. Also in successful use with soaking pits and small open hearth furnaces. Other Gunmixes of acid and neutral types, to be emplaced similarly, and larger capacity guns are in course of development.

RAMIX The original cold-ramming magnesia refractory, specially designed for new hearth construction in basic open hearth and basic electric steel furnaces. Ramix takes a quick air set and when subjected to operating temperature becomes an extremely dense, hard monolith, highly resistant to hydration. Now in use in hundreds of furnaces. Also widely used for major hearth repairs.

695 A strong plastic basic refractory designed for hot applications. Melting point well above 3600°F. 695 is widely used for making tap holes and spout linings, as well as for hot repairs at critical points in many types of metal furnaces, where conditions are severe and operating temperatures unusually high. Shipped in bags ready to use, requiring only tempering with water.

RAW DOLOMITE

Washed open hearth dolomite in standard ⅝-inch size.

BASIC REFRACTORIES, INCORPORATED

845 HANNA BUILDING
Cleveland 15, Ohio

mination Act as the length of time to get plants cleared.

Termination settlements are to be negotiated by the contracting officer and the company and under the termination law are supposed to be final and not subject to review by any other agency of the government except in cases of fraud. Outside of the prohibition against criminal fraud, there is no law to prevent any item from being included as a legitimate cost of a contract except conscience.

Contractors should not rely upon this. An agreement may not be illegal as being directly prohibited by law, yet there could conceivably be agreements between companies and contracting officers which would be against public policy.

In an effort to be liberal, Congress and the War and Navy Departments have laid a trap for the unwary, unwittingly perhaps. The Comptroller General is only empowered to look for fraud, but it is known that all agreements will be most carefully scrutinized by the General Accounting Office.

If enough cases of bad faith, or perhaps only ignorance of the contracting officer and company representatives, are discovered by the Comptroller General, these cases will be reported to Congress. If the cases are numerous enough and look too badly, then the Termination Act may be changed, to permit the re-opening of settlements which proved to be contrary to public policy. There will always be a danger of this so long as the government persists in maintaining a termination policy which opens the door as wide as the Pacific Ocean to misdirected thinking, conniving, bad faith and dishonesty.

After all, in ordinary business the line between what is shrewd business and what is dishonest and what is illegal is frequently very thin. The temptation to do what is not prohibited by law in negotiating settlements will be very great, particularly in view of the fact that there are no detailed standards set forth for making settlements. Competition being what it is will force almost every contractor into the frame of mind that he must take every advantage he can, because he believes that his competitor will.

Assuming that the average settlement officer for the services and for the companies are honest men and want to do the right thing and large errors will come about if only through a desire upon the government man to be congenial and upon the part of the business man to be shrewd and a close dealer. The cases of fraud and bad faith may be few, but the results of so loose a policy cannot help but result in severe criticism of business if the settlements ever are ordered re-opened by Congress.

Even upon review of settlements by the agencies, there will be no uniformity of decision or following of precedent. H. Struve Hensel, the Navy's General Counsel, recently said that the Navy was trying to keep away from the accounting approach and too much red-tape in making settlements and no published findings in termination cases.

Billions of dollars are being dealt with by government departments and private companies daily and the laxity of thinking which goes under the name of liberality toward business may boomerang. The public which is paying a huge tax may become justly hostile toward all business unless the greatest care is used to see to it that termination settlements do not become a nation-wide racket.

American idustries should insist that their trade associations submit plans to take care of the termination inventory problem which now threatens chaotic results. Business associations should insist upon repair legislation for contract termination and the establishment of certain minimum standards to protect both industry and the government against too generous judgment of officials on the one hand and too stingy and capricious negotiated settlements on the other.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

BLAH! US YOUNG GUYS ARE TURNIN' OUT FIVE TIMES TH' WORK YOU OL' BIRDS USED TO! IT'D TAKEN YOU BIRDS TWO DAYS TO TURN OUT THIS JOB I'LL DO IN TWO HOURS!
WHO MADE IT POSSIBLE? US OLD BIRDS WHO INVENTED THESE MODERN MACHINES! US OLD BIRDS WHO WENT THRU THE AWFUL GRIND TO MAKE YOU SQUIRTS LOOK GOOD! US OLD BIRDS WHO--
THAT'S TH' WAY TH' WAR'S GONNA END --I KNOW IT-- TH' LAST ONE DID! THE OL' BOYS WHO DID TH' MOST TO WIN IT ARE GONNA BE PUSHED INTO ROCKIN' CHAIRS WITH TH' ROCKERS OFF!
THE COMERS
11-10 J.R.WILLIAMS
COPR. 1944 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.

September Strikes Fall Below August

Washington

• • • **Summary of strikes** in the nation compiled by the U. S. Bureau of Labor Statistics shows that an extension of the August strike of supervisors in the bituminous coal mines, one at the Ford Motor Co., at the Todd-Houston Shipbuilding Corp., and the Revere Copper and Brass Co. in Chicago were the major strikes during the month of September.

There was a small decline in the amount of strike activity from the previous month the total for September being 390 strikes involving 180,000 workers and 660,000 man-days of idleness, according to the Bureau's estimates. Idleness was 9/100 of 1 per cent of the available working time. These figures include all strikes covering as much as one shift of workers, excluding stoppages involving fewer than six workers.

SHEFFIELD MULTICHEKS

WILL HELP YOU BE COMPETITIVE

when you Convert!

★Millions of additional man-hours, many acres of floor space, and thousands of hard-to-get conventional gages would have been required in 1942-3 for the manufacture of war materials *if MULTICHEKS had not been available.*

Developed originally by Sheffield's research engineers to check projectiles, cartridge cases, fuses, and other ordnance components, MULTICHEKS are now being applied to countless other aircraft, automotive, and mechanical parts similar to those which will be produced in volume after the war.

From two to twenty dimensions, and in some cases even more, are being checked simultaneously in one quick, positive operation on the MULTICHEK. Red, green, and amber signal lights indicate whether each dimension is undersize, oversize, or within tolerance. The operator, however, normally watches only the Master Light, an exclusive Sheffield feature.

Tolerances in thousandths or ten-thousandths of an inch can be checked to an accuracy of ten-millionths. *The full manufacturing tolerance can always be utilized because no allowance for gage wear is necessary.* And the human element of error is entirely eliminated. This truly means faster inspection and fewer rejections. The initial and maintenance costs of conventional gages are reduced in proportion to the number of dimensions checked on the MULTICHEK.

Be competitive when you convert. Plan now to reduce your inspection costs with MULTICHEKS. Engineering quotations gladly made without obligation and in the strictest confidence. WIRE OR WRITE.

★More than ten million man-hours of gaging time were saved in 1943 by the hundreds of MULTICHEKS used in war production (assuming they were operated ONLY one shift per day).

ARMY E ★★ NAVY
SHEFFIELD MASTER CRAFTSMEN

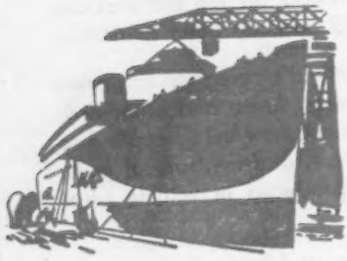
THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

WEST COAST . . . OSGOOD MURDOCK

• Puget Sound heavy industry not too much troubled by reconversion . . . Pacific Car & Foundry seen as a prime postwar bet on West Coast . . . Shipyard strike at San Francisco Steel affects output.



SEATTLE — Reconversion problems in general are troubling Puget Sound heavy industry very little, with the possible exception of Boeing, whose present preoccupation with B-29 Superfortresses will continue until VJ and then probably terminate with fearful suddenness. But that is another story.

Practically every other industrial plant hereabouts can use its war-swollen, modernized production facilities for postwar products—and plans to do so. Moreover, ferrous industry in this area has developed as an auxiliary to the Bremerton Navy Yard, and it is generally expected that overhaul, conversion and maintenance of Navy, supply and merchant marine vessels on the Pacific West Coast will carry over for several years, if not permanently, after war's termination. This should keep the best, at least, of the well-sheltered deep water shipbuilding plants on the Sound occupied for a good share of their time and capacity.

There seems to be no serious apprehension here, such as occurs sporadically elsewhere further south, about the East converting first and getting the jump on peacetime civilian production. "Perhaps we can learn from the East what not to do," seems to be the more common reaction. With several more years of feverish war work ahead and the entire overhaul of our Naval and auxiliary equipment long overdue, Northwestern industrial leaders seem reconciled and undisturbed.

Labor relations in general are the best they have ever been here, and fundamentally improving. In contrast to the somewhat more turbulent southern coastal areas, management and labor seem to understand each other better. They plan to work out their difficult, but by no means impossible, industrial future jointly. There is general acceptance of high wages, and both parties to collective bargaining believe that lower labor costs can be shown—particularly with competitive production. They agree that the Eastern - seaboard - plus - intercoastal-freight basis for pricing ferrous raw materials has been the principal handicap to expanded production in the past. They are jointly resolved that some more favorable basing point price must be worked out for the postwar period.

In the current War Chest drive it is pointed out that there are now 150,000 wage earners in Seattle plants employing 20 or more persons. An average contribution of $5.00 per capita was set up in the budget, which may indicate that sights are up.

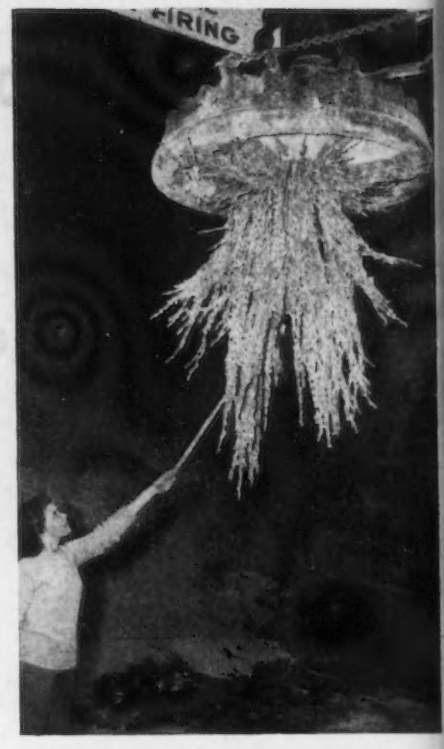
BETHLEHEM is steadily and unobtrusively operating its five open hearths at suburban Georgetown, rolling now for maritime construction angles running 9 x 4 x 9/16 in., 8 x 4 x ⅝, ½, and 7/16 in., and 7 x 4 x ½, 7/16 and ⅜ in. These of course are in addition to the bars, shapes up to 8-in., and universal plates that have always been turned out at this plant.

* * *

Northwest Steel Rolling Mills have been handicapped by a low wage scale and unhappy labor situation that has tied up operations from time to time, and prevented fulfilling schedules and supplying warehouse and industrial customers.

* * *

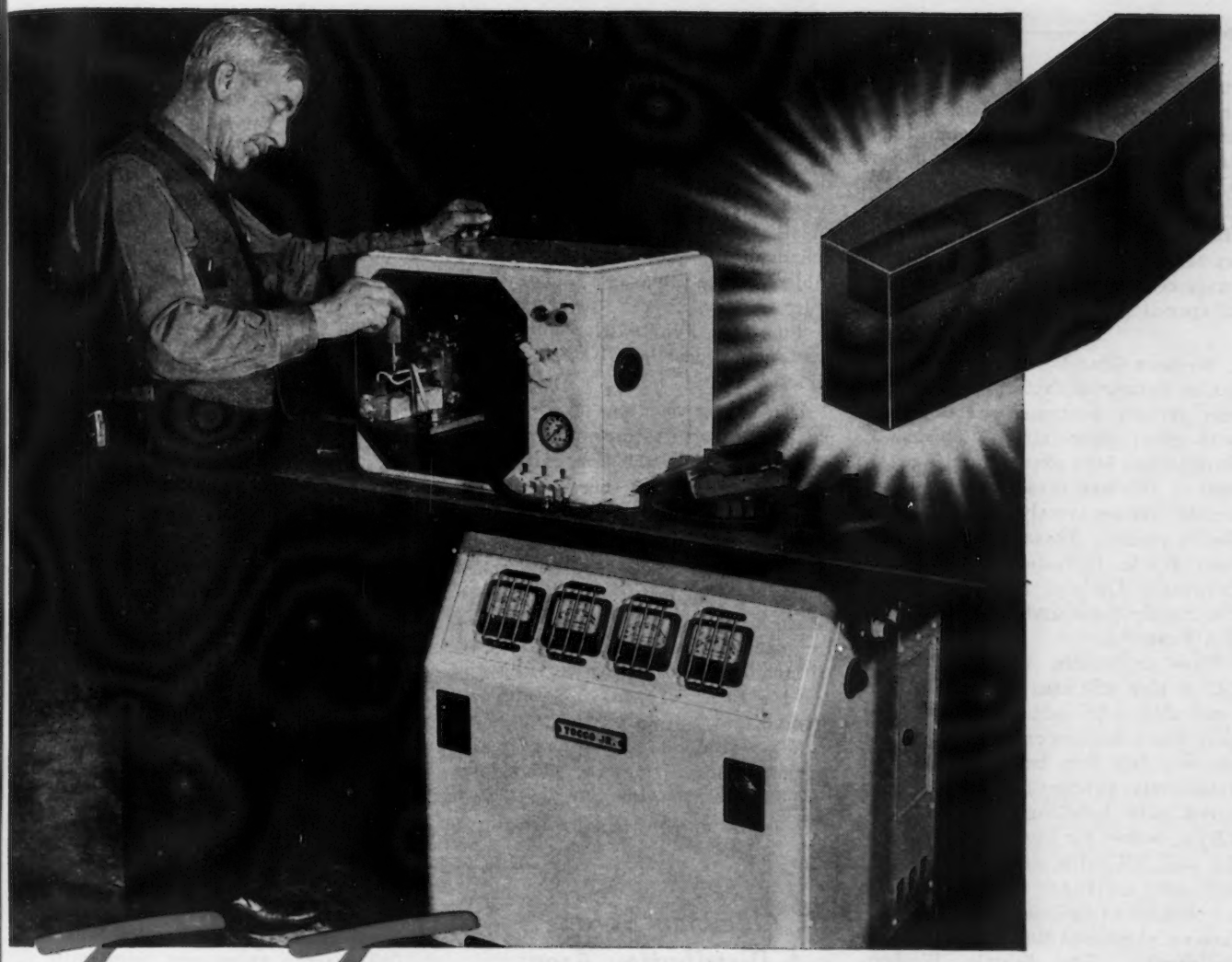
Pacific Car & Foundry is one of the prime bets of this area postwar. It is now employing about 2500 instead of 700 to 800 in the prewar period and has two good-sized fabricating plants, a shipyard at Everett, a modern machine shop quadrupled in size in the last four years, and a $3,000,000 modern steel foundry belonging to the Government which is to become an integral part of this company's operations. In addition to contract fabricating and ordinary job and custom work, postwar emphasis will be on Carco metal steel cast products especially for the logging, contracting and earth-moving industries. Their line will include hoists, arches, cranes, dozers and a new transmission to adapt these attachments to tractors. There is some doubt whether this company will ever return to car building.



BULLET CHANDELIER: *Hundreds of .50 caliber bullet cores make up this "chandelier" at the Ford Willow Run Bomber Plant. Spent bullets, from machine guns on Liberator bombers being tested for alignment after assembly pile up in the sand pit and are periodically picked up by the large magnet.*

* * *

Isaacson Iron Works is the other big local heavy industry with an equally creditable war record on Navy construction. Here are two big fabricating plants, the third largest forge shop in the United States with a capacity of 10,000 tons a month of marine forgings, two big 25-ton electric furnaces to pour forging billets from the lowest priced and most beautiful scrap in the country, and a new galvanizing plant. This firm has been turning out 60 per cent of all ship shafting for the whole country, and saying very little about it. Postwar it will continue to supplement the Bremerton Navy Yard and will re-



TOOL-TIPPING ... 5 TIMES AS FAST WITH "TOCCO"

IN the brazing of carbide tool tips, a large automobile and aircraft manufacturer formerly required 5 men at 8 hours each, or a total of 40 man-hours per day . . . Today, with TOCCO, 1 man does the same amount of work in 8 hours . . . Saving 32 man-hours per day.

TOCCO brazes tool tips with the same efficiency that it does a multitude of heat-treating tasks. At the push of a button, it heats standard size tool tips to brazing temperature in 10 to 30 seconds for a tight, uniform braze. Clean, cool and compact, the TOCCO machine can be located handy in tool room or production line to speed output and minimize motions.

NEW LOW-COST TOCCO

The 7½ K.W. TOCCO JR. shown above is ideal for brazing tool tips and heat-treating many small machine parts. Power unit can be located under a bench, out of the way. Detachable work unit can be mounted on work bench as shown above. Like larger TOCCO units, it is of rugged motor-generator type, assuring dependable, low-cost operation. Fully described in Bulletin 16A, free on request.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO

TOCCO

INDUCTION

HARDENING . . BRAZING

ANNEALING . . HEATING

turn to its fabricating and job contracting. It will develop its logging and contractors' equipment lines, headed by the Wheeltor prime mover, adapting wheels and a syncro-mesh transmission to an International Harvestor TD-18 tractor. A mid-western plant or manufacturing arrangement is contemplated as this line of special products develops.

* * *

Western Gear Works has become a major industrial factor, with a little less certain postwar direction, but with great potentialities. Thomas J. Bannan has been executive vice-president of this and three commonly controlled, but separately operated, California plants. These are the Pacific Gear Works Division at Vernon, the California Division at Linwood and the Pacific Gear and Tool Works at San Francisco.

Here at Seattle, Webster-Brinkley Co. is also affiliated by interlocking ownership. In addition to routine gear and transmission making, during the war this firm has developed and extensively produced bow door and ramp gate handling equipment for LST's, cranes for big Navy auxilliary CR and AS ships, control gears and actuator units for heavy aircraft, winches, steering-gears, anchor windlasses and general Navy and Maritime equipment. The Seattle Western Gear plant now employs 2500 as compared to 500 prewar. Engineering designs and mechanical applications have been developed here for future national and distribution. This is a major war plant whose equipment, technique and production experience are such that they may be counted on as an important factor in the postwar industry.

* * *

Olympic foundry is the predominant grey iron founder, with two small electric furnaces for the only malleable production north of San Francisco Bay. A couple of years ago the crew of 225 was cut to 150 because of the hard, hot work and a wage level frozen below that prevailing on the Harbor.

Seattle seems much less a foundry point than Portland, these days, but in its entirety it is an economic element of major proportions in any estimate of the present or future of Pacific Coast heavy industry.

•

SAN FRANCISCO—Bay Area machinists continue to refuse work on ships involved in their jurisdictional fight with the local pipefitters' union.

Last week the WLB ordered the San Francisco machinists AFL local back to work. After certification of this dispute to Washington, the East Bay CIO machinists local had joined the San Francisco group in walking off all ships on which AFL pipefitters had made installations which are the subject of the controversy. The WLB order did not cover the East Bay group. Last minute telephonic clarification includes the CIO local in the directive.

At a mass meeting of East Bay machinists held yesterday they stayed off their jobs for the rest of the day to vote their future course of action today.

A new note was injected into the situation when the pipefitters asked Washington to intervene in an order issued by the management of General Engineering & Dry Dock instructing all steamfitters to return to work under the terms of the 1938 contract. Steamfitters maintain that this is in violation of Monday's WLB order and brings employers into the official picture for the first time.

Over 25 ships are now tied up; Moore Dry Dock officials describe the condition of their yards as in a state of creeping paralysis. Only a few more ships are left in the entire bay area still being worked.

The machinists will rest again today while they hold their meeting. Meanwhile members privately admit they don't know how to make the installations which are the subject of the dispute.

* * *

Confounding the out-migrant workers from this area two major contracts were placed last week.

A new Navy order for $40,000,000 has just been awarded to Ryan Aeronautical Co. in San Diego bringing its backlog up to $70,000,000 and assuring peak operation well into 1946.

Joshua Hendy at Sunnyvale has also contracted to deliver to the Soviet government 30 large turbo-generator units for an undisclosed sum but requiring the employment of additional personnel.

Another straw in the wind is furnished by the Kaiser Company Inc. as it signs a new five year power contract with the Southern California Edison Co.

11 Aluminum Scrap Distribution Areas Newly Established

Washington

• • • **The War Department** has announced that 11 scrap areas to serve as central points of distribution for aluminum scrap have been established. All aluminum to be housed in the scrap areas is Government-owned, and a large part of the material stored represents the residue from war plants using aluminum in their production, Brigadier Gen. David N. Hauseman, Director of the Readjustment Division, stated.

Aluminum scrap solids, as well as castings and briquettes, make up the biggest share of the scrap to be stored. The rest of the scrap supply comes from domestic crashed aircraft.

Borings and turnings, General Hauseman pointed out, will continue to be sold on the open market and will not be available at the aluminum scrap areas.

Already prepared to receive aluminum scrap are areas at the Philadelphia Ore Dock, serving Baltimore and Philadelphia; Chicago, serving Chicago, Kansas City and St. Louis; Camp Phillips, accommodating Wichita and Kansas City, and Fort Lewis, taking care of the needs of Seattle, Wash.

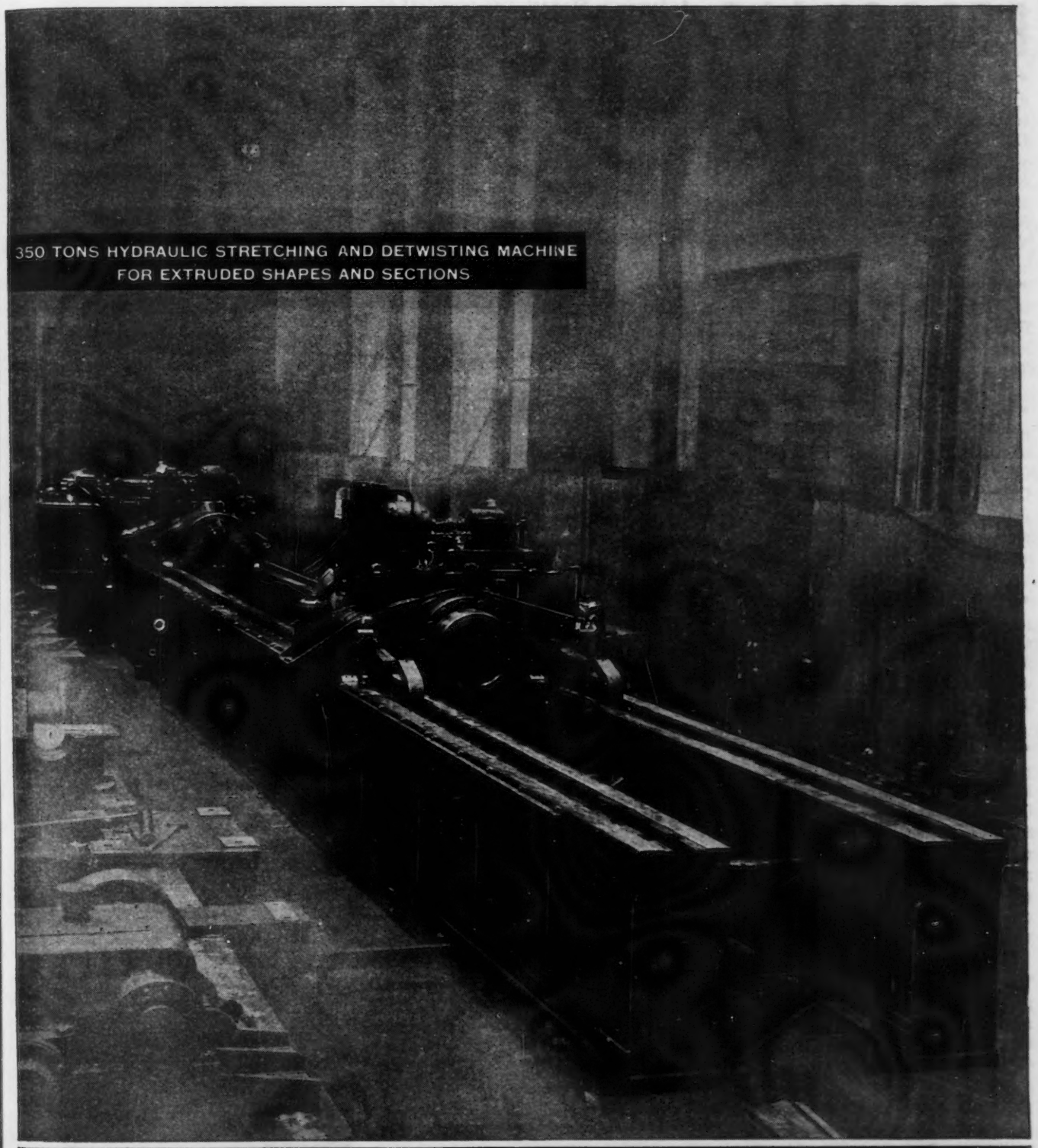
Other scrap areas are: Somerville Quartermaster Depot, for New York City; Lake Ontario Ordnance Works, for Buffalo, and Grand Blanc, Mich., to serve Detroit.

Areas yet to be activated are: Camp Forrest, for Memphis and Nashville; Camp Howze, for Dallas and Fort Worth; Camp Haan, to serve Los Angeles, and Camp Gruber, operating for Tulsa and Oklahoma City.

Pittsburgh Steel Report Shows $195,452 Net for Quarter

Pittsburgh

• • • **Pittsburgh Steel Co.**, reported a net profit for the quarter ended Sept. 30, 1944, of $195,452 after provisions of $71,500 for federal and excess profits taxes and state income taxes. For the nine months' period ended Sept. 30, however, the net income reported amounted to only $122,551. The sharp difference is accounted for by heavy provisions for depreciation, depletion and amortization, the latter including a heavy amortization due to company certificates of necessity. For the quarter, these provisions were $876,008, while for the nine months' period they were $2,679,938.



350 TONS HYDRAULIC STRETCHING AND DETWISTING MACHINE
FOR EXTRUDED SHAPES AND SECTIONS

HYDROPRESS · INC.

ENGINEERS CONTRACTORS

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PERSONALS

• **Earl J. Hewitt** has been appointed district manager in Washington, D. C., of the Copperweld Steel Co., Warren, Ohio. For the past two and one-half years he has been with the Export Steel Branch of the WPB. Prior to that Mr. Hewitt was with Republic Steel Corp., Export Department, New York.

• **Ralph Kelly** has been elected a member of the board of directors of General Steel Castings Corp., Eddystone, Pa. Mr. Kelly is president of The Baldwin Locomotive Works.

• **Arthur P. Emmert**, former vice-president in charge of manufacturing, has been named president of Warner Gear Division of Borg-Warner Corp., Chicago. **E. S. Russey** has been appointed vice-president and general manager and **J. O. Moore**, works manager.

• **R. B. Jones** has been assigned to production and shipments scheduling, Osborn Mfg. Co., Cleveland. **Page A. Mead**, assistant in Osborn's market development work, has replaced Mr. Jones in the Cleveland sales territory.

• **Benedict J. Goltra** has been appointed superintendent of the No. 5-10 blast furnace department at the South Chicago plant of Carnegie-Illinois Steel Corp. succeeding **Evan R. Yundt**, resigned. Mr. Goltra has been employed by Carnegie-Illinois for the past 26 years, being promoted to general foreman of the No. 5-10 department in 1940.

• **John A. Marshall** has been appointed assistant to the general sales manager of Wolverine Tube Division, Calumet & Hecla Consolidated Copper Co., Detroit. Mr. Marshall has been connected with the advertising, sales promotion and sales departments since 1937 when he came to Wolverine. He will continue to supervise the advertising department in addition to his new duties.

• **H. A. Goodwin** has been appointed director of sales of Solventol Chemical Products Inc., Detroit. Mr. Goodwin came from Continental Can Co. where he was director of sales development and advertising. **G. W. Onksen** has been named manager of industrial engineering and service. He comes to Solventol from the Guide Lamp Division, General Motors Corp., Detroit, where he was supervisor of process engineering.

• **James A. Stewart**, vice-president of the American Can Co., New York, formerly in charge of packers' can manufacture, has been made head of a newly formed research and development department. All of the company's research, experimental, new development and marketing resources will be focused in this one department.

• **A. J. Schmitz** has been appointed Pacific regional manager of Allis-Chalmers Mfg. Co., Milwaukee. He joined the company in 1914, and for 11 years was in charge of Allis-Chalmers operations in Cuba. Prior to his present appointment, he was manager of the Seattle office.

• **Sam Crabtree**, Republic Steel Corp. executive, has resigned from the WPB Steel Division and has returned to Republic. Mr. Crabtree, who has been with WPB for two years, was chief of the Alloy Steel Branch.

• **C. W. Garvey** has been made general manager of the Guardian Steel Corp., Detroit. Formerly Mr. Garvey was associated with Jos. T. Ryerson & Son, Inc., for 16 years and more recently with the WPB Iron and Steel Branch.

• **Frank Renner** has joined the staff of sales engineers covering the southern California territory for the Foxboro Co., Foxboro, Mass. His headquarters are at the company's Los Angeles office. **Robert Beers** has also become affiliated with the company's staff of sales engineers in the New York-New Jersey territory. Mr. Beers was formerly associated with the American Brass Co., and Whitehead Metal Products Co., Inc.

• **Henry Barnhart**, formerly manager of the Shovel and Crane Division of Lima Locomotive Works, Inc., Lima, Ohio, has been made vice-president in charge of Shovel and Crane Division. **Albert J. Townsend**, chief mechanical engineer of the company, has been appointed vice-president in charge of engineering.

• **John J. Moffatt** has been appointed Pacific Coast manager, which includes Alaska and Hawaii, for the Electric Appliance Division, Westinghouse Electric & Mfg. Co., Pittsburgh. Mr. Moffatt succeeds **J. F. O'Donnell**, who has been transferred to Mansfield to take charge of the contract sales department. **H. E. Grout**, manager of manufacturing, has been assigned the entire responsibility for all small motor factory operations of the company and **N. H. King** has been made manager of production planning, reporting to Mr. Grout.

NORMAN E. THOMPSON, production manager, Rheem Mfg. Co.

• **Norman E. Thompson**, formerly with Republic Steel Corp., who joined the Rheem Mfg. Co., New York, in January, has been appointed production manager of the nine Rheem plants making up the company's eastern division.

• **J. E. White** of the Kropp Forge Aviation Co., Chicago, has been appointed sales engineering representative in the northern part of Illinois.

• **L. H. Schneider** has been appointed general manager of production at Toledo Stamping & Mfg. Co., Toledo. For the past 16 years Mr. Schneider has been in the employment of the Detroit Harvester Co., Dura Division, becoming plant manager in 1935, which position he held until his recent change of companies.

L. H. SCHNEIDER, general manager of production, Toledo Stamping & Mfg. Co.

ROBERT B. PARKER, assistant to president, American Brake Shoe Co.

• **Robert B. Parker** has been appointed assistant to the president, American Brake Shoe Co., New York. His duties include sales research and coordination, and responsibility for liaison between the company's metallurgical and research laboratories and the sales and production staffs of its 59 plants.

• **William F. B. Henderson,** for the past 10 years an executive of the Briggs Mfg. Co., Detroit, has been appointed vice-president and general manager of the Clearing Machine Corp., Chicago. Mr. Henderson was general manager of the Plumbing Ware Division at Briggs and also director of service for the company.

WILLIAM F. B. HENDERSON, vice-president and general manager, Clearing Machine Corp.

• **Frank J. Nunlist** has been appointed chief engineer, L. J. Mueller Furnace Co., Milwaukee. Mr. Nunlist has been with the company since 1940, serving as acting chief engineer for the past two years.

• **S. C. Bennett** has joined the staff of the Lawrance Aeronautical Corp., Linden, N. J., as chief engineer. Mr. Bennett has been associated with Bell Aircraft at Buffalo, and Marietta, Ga., since 1942, and was previously associated with Ranger Aircraft at Farmingdale, L. I.

• **Dr. Gurdon M. Butler,** research metallurgist at the Dunkirk plant of Allegheny Ludlum Steel Corp., Pittsburgh, since 1937, has been made associate director of research of the company's Tool and Die Steel Division; **Dr. Gunther Mohling** who has been conducting research at the Watervliet plant of the company, has been made associate director of research, High Temperature Alloy and Valve Steel Division; **Dr. R. A. Lincoln,** connected with the company's research laboratory at Brackenridge, has become associate director of research of the Stainless Steel Division, and **George C. Kiefer,** with the company's Brackenridge plant since 1916 has been made associate director of research for the Corrosion and Castings Division.

• **Oscar M. Havekotte** has been elected a director of Dresser Industries, Inc., Columbus, Ohio. Mr. Havekotte, for the past four years president of International-Stacey Corp. and of International Derrick & Equipment Co., will continue as head of the latter company.

• **Harry S. Ransom** has been appointed by the Ohio Steel Foundry Co., Lima, and Springfield, Ohio, as special representative in the Pittsburgh district. Mr. Ransom has for the past 15 years represented Fort Pitt Steel Casting Co. in that area.

• **J. R. Bostwick** has been appointed manager of the Southwestern district stores Westinghouse Electric Supply Co., Pittsburgh. He will make his headquarters in Dallas. **Charles H. Whiteacre** has been made stores manager for the New England district, with offices in Boston.

• **Endicott R. Lovell,** vice-president and general manager of the Calumet & Hecla Consolidated Copper Co., Boston, has been appointed president of the firm, succeeding the late Albert E. Petermann.

OBITUARY . . .

• **Charles E. Wendnagel,** 79, owner of Wendnagel & Co., Chicago, died suddenly October 14.

• **C. W. Russell,** a consultant for Palmer-Bee Co., Detroit, for the past 18 years, and previously vice-president and general manager of the Russell Wheel & Foundry Co., died recently.

• **Nicodemus Bosch,** founder of the Western Michigan Tool Works, died recently at Holland, Mich. He was 81 years old.

• **Thomas E. Smith,** plant superintendent for the Bay Mfg. Division of the Electric Auto-Lite Co., Bay City, Mich., died recently.

• **James L. Lucas,** 89, founder and retired president of J. L. Lucas & Son, Inc., Bridgeport, Conn., died October 19 in Florida. Mr. Lucas was known as one of the pioneers in rebuilding machine tools.

• **Simeon R. Tyler,** vice-president and secretary, Laclede Steel Co., St. Louis, died recently.

• **H. Parke Thornton,** 48, vice-president and controller of White Motor Co., Cleveland, died October 24.

• **C. Winthrop Whiting,** retired New England agent of the American Steel & Wire Co., died in Plymouth, Mass., October 25. He was 75 years old.

• **Arthur V. Carroll,** retired machine tool manufacturer, died at his home in Cincinnati recently. He was 69 years old. Mr. Carroll was the founder of the Carroll-Jamieson Machine Tool Co., Batavia, Ohio, and also its president and general manager. He retired from active business in 1929, at which time he was operating the A. V. Carroll Machine Tool Co., Norwood, Ohio.

• **Fred Krebs,** 89, died at Johnstown, Pa., on October 13. Mr. Krebs retired from the Cambria Steel Co., in 1912, at which time he was general sales manager and a director. For many years he had charge of operations and sales of the Gautier Department of the old Cambria Iron Co.

• **Henry May, Sr.,** 83, died in Buffalo on October 15. He was one of the key executives of the Pierce-Arrow Motor Car Co. from the time of its founding early in the 1900s until he retired in 1919 as vice-president in charge of production.

Fatigue Cracks . . . .

BY A. H. DIX

We Visit With Mr. Sloan

• • • Via multigraphed invitation, a contemporary asks us to subscribe for his publication in order that we may join a group consisting of *"most of the influential members of American business. Mr. Henry Ford is one of them. Mr. A. P. Giannini is another. Mr. Alfred P. Sloan a third. And Mr. Thomas J. Watson, Mr. Victor Emanuel, Mr. John A. Hartford, Mr. Colby M. Chester, Mr. Walter S. Gifford, Mr. Paul G. Hoffman, and a host of others you know."*

We are flattered, but candor compels us to admit that we don't know any of them, except maybe Mr. Alfred P. Sloan, and then only if that gentleman remembers shaking hands with us at the last General Motors preview party given the press at the Waldorf-Astoria before Pearl Harbor.

We recall that at the time his smile was gracious. It was also tired, which was to be expected, considering that we were about 2,589th in the endless line of those he shook hands with and smiled upon. Today he might not even know us if, as they say, he fell over us.

After mentioning Mr. Sloan, Mr. Giannini, and the others, the invitation continues, *"But your name is not yet there, and lacking it our group is not complete."* Despite what our contemporary says, we think the hiatus had best remain unfilled, for we would hardly know what to talk about to Mr. A. P. Giannini, Mr. Thomas J. Watson, Mr. Victor Emanuel, and their peers. We would probably get ourselves disliked by making inept remarks, such as telling Mr. Sloan that our Dodge has stood up very well, and then mispronouncing Mr. A. P. Giannini's name and making things worse by asking what he thinks of Charley Post's article on the Western steel industry.

It would probably all end up by their getting together in one part of the subscription file and muttering, "How did he get in here?" We have no wish to embarrass the big shots, and have decided to let them continue to shift for themselves.

Aptronym

. . . My 12-year-old daughter recently gave my wife and me a 4 lb. pail of honey for an anniversary present. The label read, "S. B. Bisbee, Canfield, Ontario."

—*A. N. Conklin, Welland, Ont.*

Rejection

• • • D. C. Warren asks if we will accept as an aptronym the name of A. N. Barnard, who is dog warden of Hartford, Conn. The answer is no. It is too far-fetched. If the initials were S. T. and if the first vowel were an "e" instead of an "a" we would take it.

No Supermen They

• • • Into our teeth is thrown our recent boast, *"If you see it in your favorite family journal it is practically always so."* The missile is the scrambled captions in the Oct. 12 issue, causing a water ship photograph to be titled, *"C-46 Cargo transport now in use by Army Air Forces . . ."* with a compensating error on an aircraft picture.

"For years I have sworn by the infallibility of my favorite family journal, but I fear I must change my mind," writes Leonard Weeg, Research Chemical Engineer, of C. G. Conn, Ltd. *"How are they going to get it off the water?"* sneers "A. Friend." *"May it never fly over Florida!"* hopes Donald Roebling, inventor and builder of the famous "Alligator" amphibian tractor.

The brains department tossed the error off cavalierly. "Merely proves we're human," we were told. Further proof of editorial humanness will be furnished as required.

Adman Calls Engineering Wordy

You insist upon half truths. A ten-page article *may* be written so elimination of one-word makes it bleed. But it seldom is, for engineers are notoriously wordy—almost as bad as lawyers.

There are few really tight writers anyhow, and few top examples of tight writing. The Bible has more than its share. But it also has some windy passages . . .

—*George Appel, Witte & Burden, Detroit.*

We doubt that engineers as a class are any more or any less prolix than taxidermists or orthodontists. Mr. Appel's observation is therefore assigned to the bin marked "Harmless Fictions," where it nestles alongside the beliefs that Pullman porters are called George, that watched kettles never boil, and that barbers as a class are talkative.

We have never heard a Pullman porter called George; we have watched a kettle and it *has* boiled, and most barbers we encounter seem to be brooding over varicose veins or some other secret sorrow.

Tight writing is, of course, bad writing, as it makes for hard reading. Over-compression destroys the air cells that make a composition digestible. A prime example of what happens when too little leavening is used is Thorstein Veblen's "The Theory of the Leisure Class." Although it is a little book, we have been trying to read it for the past five years and are still not more than half way through it. A page is all we are able to digest before our mind begins to wander. This we blame on the brilliant Veblen. If he were not such a master at packing so much into a few words we are sure we would have finished the book before Pearl Harbor.

Like a properly made sand mold, good writing is neither too tightly nor too loosely packed. Your favorite family journal is a good example of the proper degree of permeability.

Small Cities That Soothe

As a restful place name how do you like Tranquillity, N. J.?

—*E. Davenport*

We like it very much. It is a far better antithesis to Bustleton, Pa., than our original choice, Still Valley, N. J. What we would like to know is whether the inhabitants of Tranquillity, N. J., are more placid than the average. It may be that they try to be, and that therefore their normal discharges of ill temper are bottled up, to be vented in large outbursts.

If this is true and if the residents of Bustleton feel impelled to bustle more than is good for them, then the town names are unfortunate and it would be better if they changed to something neutral like Arp, Texas; Jokake, Ariz.; Dauberville, Pa., or Jiggs, Nev.

Puzzles

We do not know the answer to last week's flagpole problem, as W. J. MacDonald, who sent it in, did not give us the solution. We will therefore have to wait until the master minds solve it

Answers are still coming in to the Aug. 31 problem, the old one about connecting three houses with gas, water and electricity without having any of the lines cross. We said it could not be solved. George (Inland Steel) Burns, D. F. (J. R. Johnson & Co.) Burdick, "Reader No. 19," and others proved otherwise by going under the houses. Although this solution was not specifically forbidden in our statement of the problem, it was implied. Eight connections can be made easily but the ninth is impossible.

J. W. (Ingersoll-Rand) Foster sent this one in:

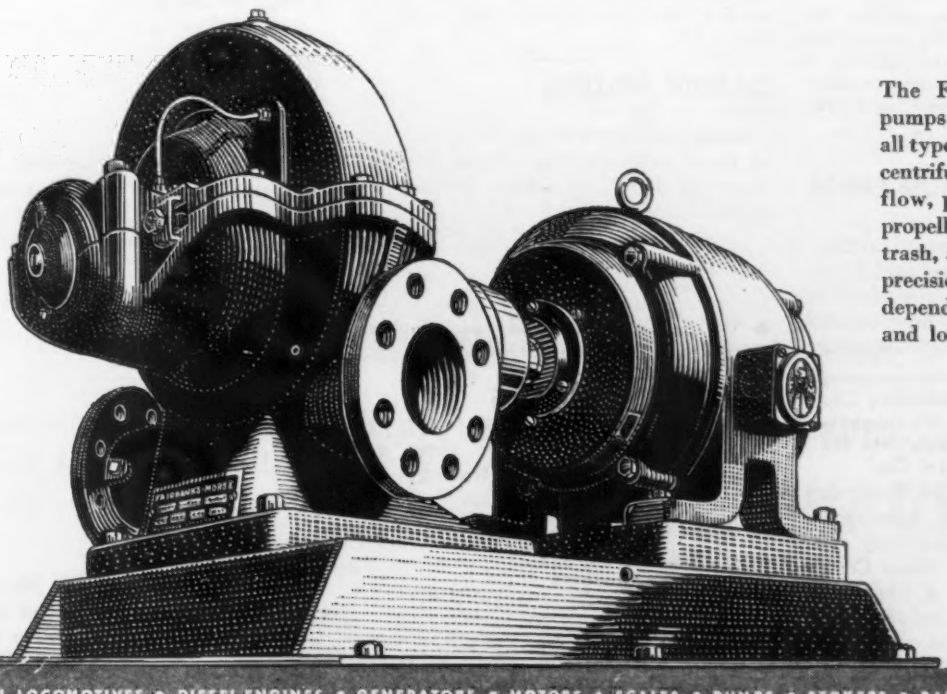
Express every number from 1 to 31 inclusive by means of five 3s. Example: 20 is $\frac{3}{.3} \times \frac{3+3}{3}$.

Mr. Foster said he also produced 33, but his stumbling block is 32 and he wonders if any of the master minds can assemble a set of five 3s to give that number.

A name worth remembering!

FAIRBANKS-MORSE

After the war, the name Fairbanks-Morse will continue to mark performance-proved products only, as it has for 114 years. No race to get civilian products onto the market early will tempt us to break this pledge.



The Fairbanks-Morse line of pumps is complete and includes all types — centrifugal, split-case centrifugal, built-together, angle-flow, power, rotary, turbine, propeller, paper stock, sewage, trash, and many others. All are precision built to give efficient, dependable, low-cost operation and longer trouble-free service.

BUY MORE WAR BONDS

DIESEL LOCOMOTIVES • DIESEL ENGINES • GENERATORS • MOTORS • SCALES • PUMPS • STOKERS • RAILROAD AND FARM EQUIPMENT

FAIRBANKS, MORSE & CO., CHICAGO 5, ILLINOIS

Dear Editor:

ELECTROSTATIC SPRAYING

Sir:

May we suggest a correction in your Oct. 19 article, "Electrostatic Spraying and Detearing." The first sentence of the last paragraph on page 52 reads, "Less saving is effected on large, flat parts, and it is quite possible that in spraying of metal sheets hand spraying would be more efficient." This should be changed to:

"On large flat parts the percentage of savings is somewhat less, due to the fact that previously used methods do not have so great a loss in overspray at the edges. On such parts it is estimated that around 30 per cent savings may be enjoyed by the electrostatic methods."

HAROLD RANSBURG
Harper J. Ransburg Co.,
Indianapolis 7, Ind.

CENTRIFUGAL STEEL CASTING

Sir:

We are particularly interested in the use and application of casting steel in centrifugal molds.

Our main problem at the moment is solid steel castings, such items as gear wheels ranging up to 24-in. in diameter.

We would be pleased if you could forward us any information, or put us in touch with any firm who could give information concerning the methods of melting and spinning the mold after or during casting, such details as speeds, etc., are needed.

E. E. TOMLINSON,
Manager
Tomlinson & Co., Ltd.,
G.P.O. Box P1223,
Perth, West Australia

● If the data in the many articles The Iron Age has published on this subject are not adequate, we recommend getting in touch with the Centrifugal Casting Machine Co., Tulsa, Okla., maker of centrifugal casting machines.—Ed.

STEEL BARREL AND DRUM ERROR

Sir:

The writer of your Sept. 21 article, "Steel Mills Capture Barrel and Drum Industry," is very much misinformed in his statements. We particularly have in mind the paragraph reading:

"Next on the list was the dropping of National Enameling & Stamping Co., Granite City, Ill., and the Niedringhaus Metal Products Co., St. Louis, into the pocket of Granite City Steel Co."

For your information, the Niedringhaus Metal Products Co. has never been and is not now in any way connected with Granite City Steel Co. or the National Enameling & Stamping Co., and we, therefore, request that you publicly retract this statement regarding our company.

R. L. NIEDRINGHAUS,
Chairman of the Board
Niedringhaus Metal Products Co.,
Natural Bridge and Goodfellow,
St. Louis 20

Sir:

Statements as promiscuous as this one often lead to very serious consequences, and if at any future time reference is made to the business of the National Enameling and Stamping Co. will you please see that the writer gets proper information?

ALFRED J. KIECKHEFER,
President
National Enameling and Stamping Co.,
Milwaukee, Wis.

SURFACE FINISH

Sir:

I would very much like to have two or three tear copies of the article by James A. Broadston, "Measuring and Designating Surface Finish," on page 62 of your Oct. 19 issue.

O. W. BOSTON,
Professor
University of Michigan,
Ann Arbor, Mich.

● See also, the second part of the series in the Oct. 26 issue. The third and last was in last week's issue, Nov. 2—Ed.

BAR IRON PRICES

Sir:

I have not been able to find the price of Western bar iron in your magazine. Will you please be so kind as to give me this information? Will you also tell me if the sliding scale prices of Western bar iron are frozen during the war?

NICK HNATIUK
Box 532,
Selkirk, Man., Can.

● The current base price on single refined bar iron is $4.40 per 100 lb. f.o.b. mill, Pittsburgh, or $5 at Terre Haute, Ind. For double refined the price at Pittsburgh is $5.40, $6.25 at Terre Haute, Ind. The price scale for bar iron is under OPA control.—Ed.

CARBIDE MILLING

Sir:

I am interested in knowing the cost of three copies of the article in your June 22 issue, "Carbide Milling of Steel."

GEORGE M. PURVIS,
Chief Tool Designer
John Inglis Co., Ltd.,
14 Strachan Ave.,
Toronto, Canada

● We are glad to send two clippings, which are all we have left.—Ed.

CORROSION RATINGS

Sir:

We would like to have three reprints of "Corrosion Ratings of Metals," in your Oct. 5 issue.

ELIZABETH WEISSINGER,
Librarian
Miles Laboratories, Inc.,
Myrtle & McNaughton St.,
Elkhart, Ind.

Sir:

Could we get two clip sheets of "Corrosion Ratings of Metals."

T. P. HALL,
Chief Development Engineer
Consolidated Vultee Aircraft Corp.,
San Diego, Cal.

Sir:

Please send us reprints or tear sheets of "Corrosion Ratings of Metals."

W. MARCOVITCH,
Division Standardizing Section
Radio Corporation of America,
Camden, N. J.

HARD, "SOAPY" FINISH

Sir:

I recall an article you published regarding a case hardening treatment that imparts a "soapy" finish which results in prolonging wear life as much as 25 times and also makes parts resistant to non-violent corrosion. When did this appear?

J. M. CLARK
Jas. Clark,
143 17th Ave.,
Paterson 3, N. J.

● See page 62 of the Jan. 13 issue, article by A. S. Eves, "Modern Heat Treatment Takes a Lot of Know How." The paragraph on Ihrigizing reads in part:

". . . The surface has a peculiar 'soapy' feel which aids materially in the reducing of friction and prolonging wear life. Malleable chain links under arduous service, for example, wear at least 25 times longer when so treated."

Ihrigizing is a patented process controlled by the Globe Steel Tubes Co., Milwaukee. —Ed.

TIME STUDY

Sir:

Would it be possible for me to get reprints of your time study series, Aug. 17, Sept. 28 and Oct. 19 issues?

A. W. MacDONALD,
Supervisor
Curtiss-Wright Corp.,
Propeller Division,
Caldwell, N. J.

Sir:

Your Oct. 19 article, "Your Incentive Will Work If Properly Planned," is extremely interesting. Could we get a copy of the series?

F. MARGARET TAYLOR,
Librarian
Ottawa Car and Aircraft, Ltd.,
P. O. Box 237, 301 Slater St.,
Ottawa, Canada

Sir:

I think the work being done by Messrs. Anderson and Hansen in the series on time and motion study is indeed excellent and would appreciate a reprint.

KENNETH URAN,
Production Control Manager
Columbian Enameling & Stamping Co., Inc.,
Terre Haute, Ind.

Sir:

I would appreciate receiving a reprint.

R. T. BURGESS,
Tool Engineer
Bata Shoe Co., of Canada, Ltd.,
Batawa, Ont., Canada

Sir:

I am enthusiastic over Messrs. Anderson and Hansen's concise presentation and would like to have reprints.

T. S. LOCKARD,
Controller
Keeley Stove Co.,
Columbia, Pa.

● Reprints are now being made and will be supplied at cost.—Ed.

A SPRING means more than just a season

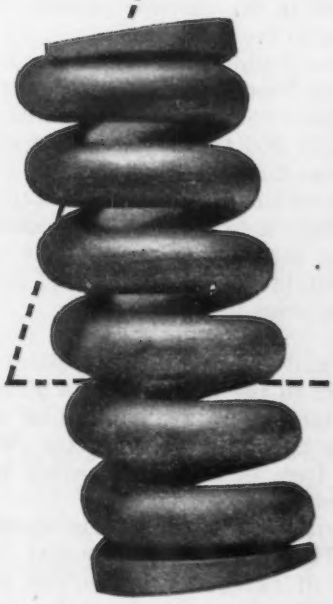
—to the Ford Tractor with Ferguson System!

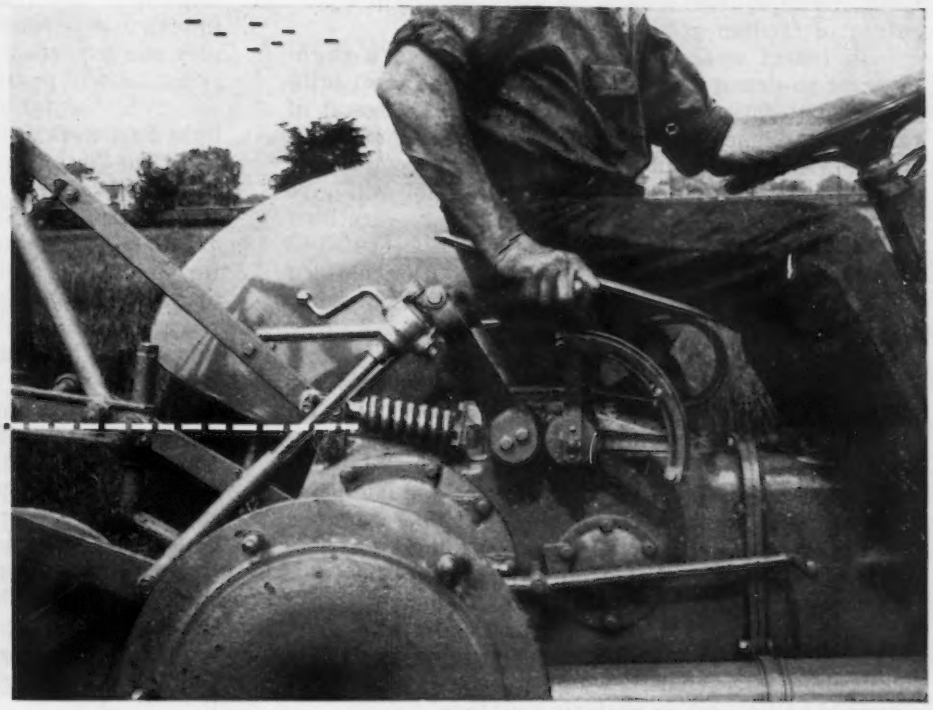
PERHAPS you've read about the new Ford Tractor—Ferguson System of farming. How the tractor pulls the implement at a prescribed depth in the ground. This is accomplished by an ingenious hydraulic control, the heart of which is a Muehlhausen Spring. Any variation of the resistance on the implement in the ground causes a flexing of this spring, which, in turn, controls the amount of oil in the hydraulic cylinder, thus holding the implement at a fixed depth.

Manufacturing tolerances are extremely exacting, especially for a hot-coiled spring. Length must be held to 3/64 of an inch and the load within 5%.

This well-engineered spring is a product of the Muehlhausen modern hot-coiling plant, which specializes in heavy springs made to precision tolerances.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
817 MICHIGAN AVENUE • LOGANSPORT, INDIANA





To improve product performance, use

MUEHLHAUSEN Designed SPRINGS

WRITE FOR LARGE SPRING FOLDER!
Showing the extensive facilities at Muehlhausen for making large springs.

This Industrial Week . .

- **Steel Market Reflects Confusion**
- **Scrap Market Shows Strength**
- **Ingot Rate Gains 2½ Points**

STEEL order volume was heavy this past week and the output of steel ingots continued at a relatively high level, but all was not tranquil in the minds of those who make and those who buy steel. Confusion was mounting this week as to the probable trend of postwar steel order volume, while at the same time the popular ban on postwar talk made many with definite plans reluctant to disclose them.

Those in the steel industry know well that there is enough capacity and manpower to keep war steel requirements on schedule. Some believe that there is more than enough output for such purposes. With more cancellations bound to come, with last minute changes often made in orders already placed and with holes opening up regularly on rolling mill schedules, the feeling is growing that more definite information from official sources should be given on the probable output of civilian goods.

In recent weeks war needs have shown a slight increase in demand, but at the same time steel mills have had to fill gaps in their schedules as a result of partial or complete cancellations on some items. This situation has made all steel sales offices competitive minded even as they know they must and will give war requirements absolute precedence over everything else. The product mix, however, which keeps steel mills operating so that the best distribution pattern is obtained, is rearing its head higher than for some time.

WHILE orders for quonset huts, ammunition and other needed war items have increased, plate directives are on the down grade and some large manufacturers are nearing the end of some of their biggest war contracts. Thus while current order volume looks good from a statistical standpoint, steel operators are beginning to worry about enough business to adequately operate facilities after the turn of the year. The feeling is growing that with the lack of more definite reconversion plans, the first quarter of 1945 may see a drop in steel output because there is not sufficient volume of various types of steel orders to insure a normal and economic operating pattern.

Postwar orders were still rolling into steel mills this week and the total volume of such business was definitely increasing. This type of bookings can be accepted but cannot be rolled until proper approval from WPB makes this possible. Some orders do not show exact specifications or any delivery schedules. Some are for total deliveries as soon as restrictions are off, while others are for an indefinite delivery period. Because of this situation, steel companies are in no position to make definite production plans.

ANOTHER factor which lends credence to the possibility of a lower operating rate is the report that December lend-lease bar and semi-finished tonnage for the United Kingdom will be cancelled, thus further easing the situation in these categories. Total lend-lease tonnages for the first quarter of 1945, because of the almost disappearing demand from Great Britain, will probably not be an important factor in regular steel shipments.

Signposts that some war manufacturers are winding up some important war contracts are found in the following: A large Detroit aircraft manufacturer in the automotive field has drastically reduced his commitments to a forge shop in the Chicago area; another shell producer in the Chicago district whose normal field is appliances has wound up his shell production; a prominent tank manufacturer is purchasing equipment and has arranged for building construction to allow him to enter the stainless steel tank field. An implement manufacturer of prime importance in the industry is arranging to produce domestic refrigerators and ice cream boxes in the postwar period. Distribution will be limited to the farm trade.

Potential freight car building is still in the limelight this week, with the New York Central inquiring for 1000 70-ton gondolas. The Brazilian Government Railway is asking bids on 900 freight cars of various types. Canadian National Railway is inquiring for 500 40-ton steel sheathed wood-lined box cars. The picture for steel fabricators which a few weeks ago appeared to be clouded following completion of maritime contracts continues to be brighter with a number of building and engineering inquiries listed.

LARGE government nail and barbed wire orders are prime contributors to the wire products picture. Nail stocks in industrial centers are said to be slim although rural supplies appear to be adequate. Wire rope is still a critical item in the wire market with little prospect of immediate improvement.

The steel scrap outlook this week was showing signs of strength. The Philadelphia market was stronger to the extent of an increase in prices, part of which was occasioned by shipments from that point into the Pittsburgh District. Other markets such as Pittsburgh seemed this week to be posed for price increases and it looked like the bottom had been reached in the movement which began when open hearth grades sold under ceiling prices some weeks ago. THE IRON AGE scrap composite price this week advanced 17c. a gross ton to $15.92 a gross ton.

National steel ingot operations gained two and a half points to 96 per cent of capacity. Output gains occurred in the following districts: Chicago, up one to 101 per cent; Youngstown, up three to 95 per cent; Cleveland, up one to 100.5; Buffalo, up 22.5 to 104.5; Wheeling, up one to 93; Birmingham, up six to 94, and Cincinnati, up five to 100 per cent. Pittsburgh at 93; Philadelphia at 96; Detroit at 100.5; St. Louis at 92.5, and the Eastern District at 95.5 continued unchanged.

• **CHANGE HANDS**—A. M. Castle & Co., Chicago warehouse firm with outlets at Los Angeles, San Francisco, Oakland and Seattle, has purchased effective Jan. 1, 1945, Gibbs Steel Co., Milwaukee, largest independent Wisconsin steel distributor. Gibbs will be operated as a subsidiary company. Founded in 1922, the Wisconsin firm provided the answer to Castles long-time desire to operate in that state.

• **JET UNITS**—Preparations are being made to begin quantity production of jet propulsion units for the Army Air Forces at the Indianapolis plant of General Motor Allison Division, GM has announced. Production, which will start shortly after the first of the year, will be in addition to present production of Allison liquid cooled V-1710 engines, DPC has chucked out $12,500,000 to provide equipment, 17 specially designed test cells, and building additions for the new model.

• **FARM COMPLAINT**—Farm areas are complaining at inability to purchase wire corn crib for temporary storage. In some sections a scarcity of common nails again is reported, due presumably to export packaging requirements. Export orders for substantial tonnage of wire type mesh landing mat appear to be shaping up.

• **CIO LOSES AGAIN**—In its third attempt to become collective bargaining agent at the Butler, Pa., Division of American Rolling Mill Co., the CIO was decisively defeated on Oct. 27. With the CIO the only union on the ballot, and employees having the choice of voting "yes" or "no," there were 1301 votes cast against the CIO and 987 in favor of the union. This is the sixth NLRB election in Armco plants in which the CIO has been defeated.

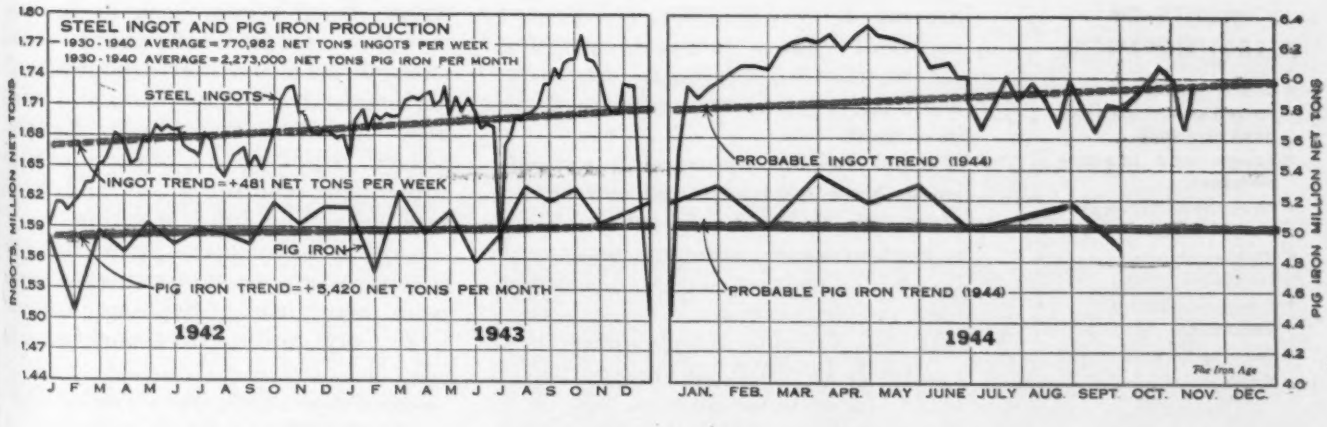
• **BUFFALO STRIKE ENDS**—A "wildcat" strike which had shut down the Buffalo plant of the Republic Steel Corp. for 10 days was ended Nov. 2 when members of local 1743, CIO-United steelworkers, voted to return to work pending selection of an arbitrator to consider their alleged grievances. More than 1900 workers were affected by the "unauthorized" stoppage which halted all operations of the mills except for one blast furnace which continued to produce foundry iron throughout the period.

• **CANADIAN STEEL OUTPUT**—In September steel output in Canada was at the rate of 8.1 per cent of capacity as compared with 82.4 per cent in August. The trend is definitely downward in the dominion. For the first nine months of this year steel output was 2,236,481 net tons as against 2,237,736 tons in the same 1943 period. Market conditions in Canada are similar to those in this country. Military cutbacks and cancellations are materializing and the trend is for definite post-war steel requirements plans.

• **NORMAN FOY TO RESIGN WPB**—Known as one of the hardest workers in the steel division of WPB and credited with being a leading figure in devising the steel quota plan which later developed as the controlled materials plan (one that worked) Norman W. Foy, Steel Division Director, is expected to return to Republic Steel Corp. about Dec. 1. He will be succeeded by William B. Todd, it is said, who is now Deputy Director. Mr. Todd was formerly with the Steel Export Association in Britain, a member of the Harriman Mission and at one time vice-president of sales for Jones & Laughlin Steel Corp. Mr. Foy spent the last three years in Washington having gone through all the various stages of WPB's charges, changes and successes.

• **STEEL SCRAP OUTLOOK**—For the past few weeks the scrap markets have shown a tendency to mark time. Opinion at Pittsburgh this week is that the market may go higher soon in view of the belief that the war in Europe may not end as soon as had been expected. The future trend of prices will probably depend wholly upon what course the war takes in Europe. There are still some scrap buyers and sellers who are not ready to predict a return to the ceiling price for open hearth grades (cast grades have remained firm at ceiling, while open hearth grades have declined.) There are others who believe that the bottom in the current move has been reached but that there will be hesitation pending more substantial information that fluctuations occurring as the regular market factors of supply and demand operate may now be expected between present prices and the ceiling. While shortages are being talked up, it is recalled that in the past drastic shortages did not appear although they were freely predicted. Such predictions, however, while not being outdid, serve to make the country scrap conscious. They did their part in preventing the carrying out of the predictions.

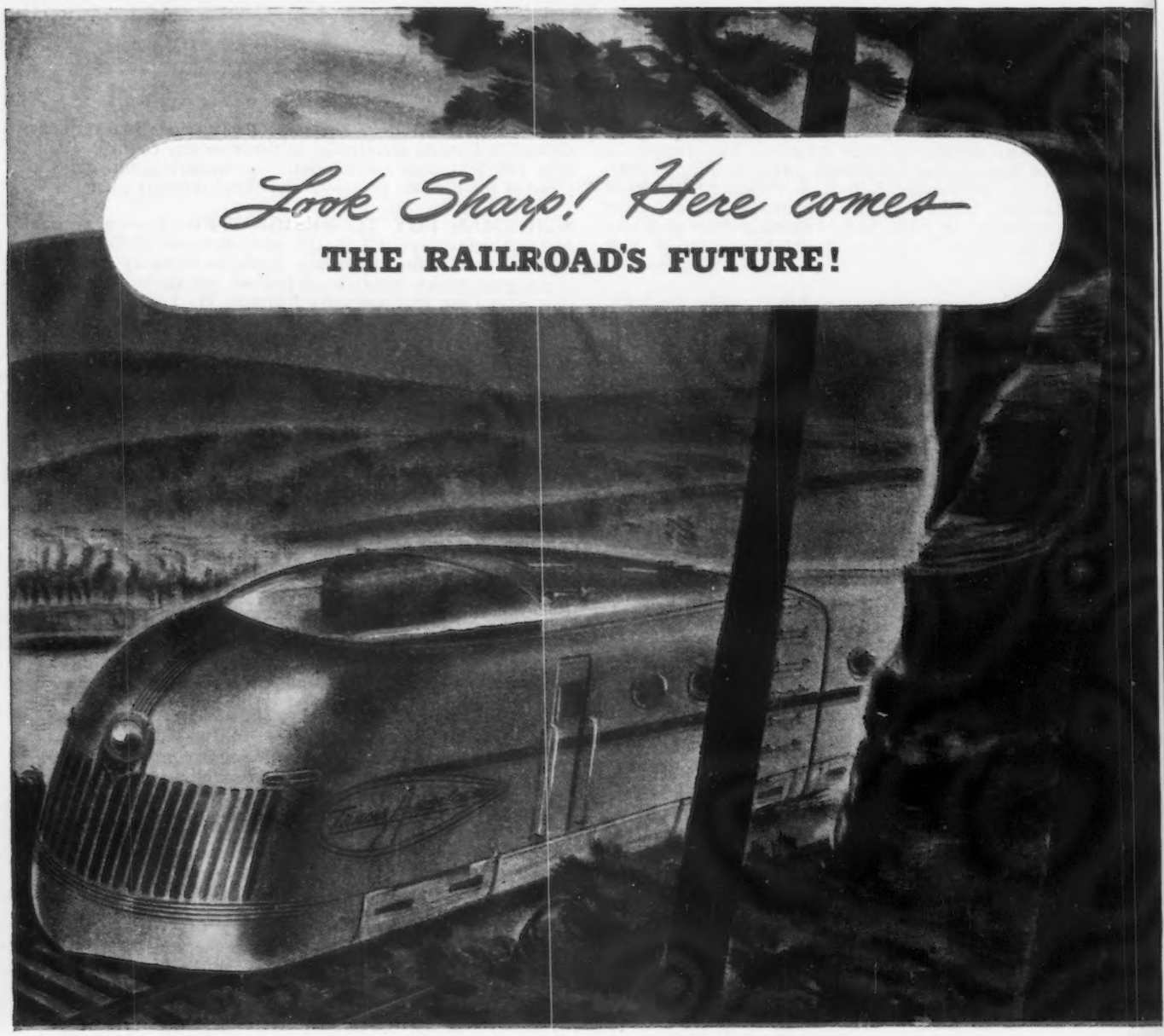
• **STEEL VERSUS LUMBER**—The use of light gage steel sheets in the fabrication of barracks, mess halls, and other needed war buildings has shown the way for post-war uses according to Milton Male of the U. S. Steel Corp. Mr. Male, a research engineer, argued light steels' case before the American Institute of Steel Construction at Atlantic City last week, contending that experience shows that this type of steel is now a real competitor of lumber.


STEEL INGOT AND PIG IRON PRODUCTION
1930-1940 AVERAGE = 770,962 NET TONS INGOTS PER WEEK
1930-1940 AVERAGE = 2,273,000 NET TONS PIG IRON PER MONTH
STEEL INGOTS
INGOT TREND = +481 NET TONS PER WEEK
PIG IRON
PIG IRON TREND = +5,420 NET TONS PER MONTH
INGOTS, MILLION NET TONS
PIG IRON, MILLION NET TONS
1942
1943
1944
PROBABLE INGOT TREND (1944)
PROBABLE PIG IRON TREND (1944)
J F M A M J J A S O N D J F M A M J J A S O N D
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
The Iron Age

Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
October 31	93.0	100.0	92.0	96.0	93.5	82.0	92.0	89.0	100.5	96.0	95.0	92.5	95.5	93.5
November 6	93.0	101.0	95.0	96.0	100.5	104.5	93.0	94.0	100.5	96.0	100.0	92.5	95.5	96.0

* Revised



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- ★ Favorable strength-weight ratio.
- ★ Highly corrosion-resistant.
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- ★ Easy to form and weld.

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REMEMBER THE NAME TODAY FOR THE NEEDS OF TOMORROW

Russian Tools May Replace Reconversion Business

Chicago

By C. T. POST

o o o

• • • Machine tool and perishable tool orders yet to be placed under the fourth Russian Lend-Lease protocol ending June 30, 1945, amount to approximately 77,000,000 and could seriously jeopardize unrated domestic reconversion orders for certain sizes of standard tools.

The Russian business, to be placed by the U. S. Treasury Procurement Division, carries an AA-1 priority. Under priorities regulation E-1-B, domestic military orders may not take more than 75 per cent of a manufacturer's monthly production of a machine tool of a given size, the remainder being reserved for foreign and civilian orders if they are forthcoming. This means that if the military buyers take their full quota of any tool, and Russian orders with priority are placed for the remaining 25 per cent of a manufacturer's production, unrated civilian orders will be left out in the cold

The Fourth Russian Protocol calls for this country to deliver $120,000,000 machine tools before June 30, 1945. Inquiries by the Russian Purchasing Commission have greatly exceeded this figure, and requisitions issued to manufacturers total a substantial portion of it. However, in order for production to be started, the orders also must be approved by the FEA, must be scheduled by WPB, and finally must be placed for purchase by the Treasury Department. To date, approximately $34,000,000 of machine tool orders and between eight and nine million dollars of perishable tool orders under the Fourth Protocol have cleared the Treasury. Because manufacturing schedules are frozen sixty days before the month in which production is scheduled, the remainder of the Russian orders cannot go into production before January, 1945. Prior commitments by manufacturers may prevent many Russian orders getting the green light for production until well into the first quarter assuming no speed-up in clearing the war agency hurdles.

The monthly rate of machine tool shipments for the industry has been about $35,000,000 in recent months. Unless this rate is increased, shipments for the first half of 1945 will amount to about $210,000,000. Taking the gloomiest possible view for reconversion, military orders conceivably could take about $157,500,000 and Russia the balance, leaving none for civilian industry. In an October 19 amendment to order E-1-B, WPB, practically eliminated preference ratings for civilian machine tool orders of any kind.

Those gloomy view is not justified, however, in the belief of many influential people in government and the machine tool industry. Currently, machine tool production is under wraps, the industry devoting a considerable portion of its plant capacity to production of direct war goods. The current monthly machine tool shipment level of about $35,000,000 compares to a peak of $131,960,000 reached in December, 1942. While manpower and other factors are believed to preclude hitting this level again, the industry's production could conceivably be boosted to the neighborhood of $100,000,000 if direct war products contracts were reduced. The WPB has asked manufacturers who wish to be relieved of these contracts to communicate with the tools division, but so far no such requests have been received.

Many of these direct War Goods contracts will expire in the first half of 1945, and at the same time machine tool production for the services currently is on the down-grade. If this trend is maintained, military requirements for many types of tools will be considerably less than the 75 per cent maximum, thus broadening the slice of total productive capacity available for foreign and unrated civilian orders. Other foreign requirements than the Russian are expected to be small, and, WPB has stated, will probably be unrated.

Nearly all of the Russian orders are standard tools. Essential domestic reconversion demand, of which about ninety per cent—or about six to seven thousand machine tools—is for the automobile industry, is principally for special tools. Thus in many cases there will be direct conflict for any given sizes and type of tool, and in some cases complete civilian requirements may be filled.

Still other factors may disperse the impact of the Russian orders. Machine tool manufacturers almost universally proclaim the impossibility of producing and shipping the entire protocol by June 30, both because of restricted capacity and because of inability to procure such critical components as motors and pumps on such notice. Moreover, the Russians, in addition to early delivery, are said to be specifying special terms, such as inclusion of a cancellation clause. Manufacturers naturally shy at such provisions under present market conditions. If the Russians are insistent upon their inclusion, preference ratings may be vitiated under the terms of priorities regulation number one.

No official leeway is being given on the June 30 deadline, which marks the end of the protocol, but it is pointed out that previous protocols have not always been completed on schedule. If the deadline passes with the protocol unfulfilled, and Russia still needs the tools, there is little doubt that she will get them.

If the matter were left up to individual manufacturers, most would allot from 30 to 50 per cent of their capacity to Russian business, an informal survey by THE IRON AGE shows. This would leave sufficient

NIGHT LIGHT: *One of the weapons that have helped win the submarine war is the Leigh Light, searchlight attached to planes of the Costal Command.*

space to take care of unrated domestic orders as well as remaining military demand. Under priority regulations, manufacturers must accept rated orders, if they are offered, in preference to unrated — and this means Russian business comes ahead of domestic. However, the Russians, before issuing requisitions, have been consulting manufacturers as to amounts which they wish to supply. The WPB tools division, which schedules the orders, is committed to spread them evenly as to month of delivery and among individual suppliers.

The machine tool industry realizes that it must depend largely on domestic purchasers for its post-war bread and butter, and it is not willingly going to close the door on their face. Likewise, many tool builders recall that in the darkest days of the depression Russian orders were all that kept them from going under, and they are not ungrateful to the country which threw them the rope.

One authoritative machine tool manufacturer feels that military buying soon will be reduced to such an extent that Russian orders not only can be accommodated, but will allow manufacturers to smooth out schedules to such an extent that production for domestic buyers will be expedited.

On the other hand, John S. Chafee, Director Tools Division, WPB, told the recent National Machine Tool Builders Association convention, "in a shortage situation, the problem is difficult and has had much top WPB consideration. It isn't one that can be settled by shouting at each other or pounding the table. There just aren't enough machine tools yet to go around and this problem is going to take the very best and most intelligent effort we can all put on it."

A recent flood of unrated civilian orders placed with manufacturers indicates that domestic buyers understand how to best protect themselves. If an order is on a manufacturer's books sixty days before the scheduled delivery date nothing less than a directive—not even a rated order—subsequently can display it. Thus if domestic buyers act swiftly they may gain undisputed possession of a foxhole on production schedules while the pack of Russian orders still is clearing war agency hurdles.

WPB Consolidates Division Functions

Washington

• • • **Effective Dec. 2,** the WPB Mica-Graphite Division will be abolished and its functions consolidated with the Miscellaneous Minerals Division in the Office of the Vice Chairman of Metals and Minerals. The Miscellaneous Minerals Division then, WPB said, will include the Mica, Fluorspar and Magnesite and Non-Metals Sections. The Non-Metals Section will have units controlling graphite, beryllium, tantalite and electrodes.

James S. McGregor, New York, will continue as director of the Miscellaneous Minerals Division and Fred G. Rockwell, Pikeville, Ky., will continue as a deputy director. Frank F. Watts, Turbotville, Pa., deputy director of the old Mica-Graphite Division, will become a deputy director of the Miscellaneous Minerals Division and Harry D. Sharpe, Merchantville, N. J., assistant to the director of the Mica-Graphite Division, will become assistant to the director of the Miscellaneous Minerals.

M. H. Billings, Minneapolis, director of the Mica-Graphite Division, has resigned to return to private industry. He will be associated with the Union Carbide & Carbon Co., a division of the National Carbon Co., at Niagara Falls, N. Y.

TARGET FOR TOMORROW: *The heart of Tokyo, as seen from the air in 1941, possible target for landbased aircraft of the B-29 Superfortress or B-32 Dominator classes. A recent false Japanese report of such a raid caused consternation in the Jap capital.*

Navy Will Retain Four Midwest Ordnance Plants

Chicago

• • • **Four midwestern plants** now producing Naval ordnance will be retained following the war as permanent shore establishments of the Navy, the Ninth Naval District has announced.

The plants are located at Forest Park, Ill., a Chicago suburb, Canton, Ohio, Louisville, Ky., and Indianapolis.

The Forest Park plant is being operated on a fee basis by Amertorp Corp., subsidiary of American Can Co., but operation on this basis will be limited to six months following the war period.

New Restrictions on Wire Rope

Washington

• • • **WPB has issued** Schedule 16 to L-211 (national emergency specifications for steel products) prohibiting the manufacture of wire rope of 6 x 9 filler wire Seale construction in diameters ¾ in. and smaller with filler wire of high carbon wire and 6 x 37 construction in diameters ¼ to 11/32 in. inclusive. The schedule also limits the number of wires in 6 x 37 construction in sizes ⅜ in. to 1 7/16 in. and contains a number of restrictions on the manufacture, delivery and acceptance of other sizes of steel wire rope.

Light Gage Steel Invading Lumber's Former Construction Field

Atlantic City

• • • **Light gage steel** will be the chief construction competitor of lumber for use in homes, barns, small factories and apartment houses after the war, delegates to the annual convention of the American Institute of Steel Construction were told.

Milton Male, research engineer for the U. S. Steel Corp. of Pittsburgh, announced to the structural steel fabricating leaders gathered here that war-tested applications of the new, light gage steel proved that it was more economical and efficient than wood.

Describing the advantages of the new product in the construction of smaller buildings, Male said that light gage steel offered fire protection, greater strength, reduced maintenance costs, and economy and speed in building.

"The exigencies of the present World War offered an opportunity and challenge to light gage steel to prove its worth. Barracks, mess halls, hangars for planes, factories and homes for war workers had to be built in a hurry. Used in combination with structural steel framing for the larger structures, and alone for the smaller ones, the light steel buildings saved money and priceless time.

"Prefabricated and demountable housing units have been shipped around the world to outlying military and naval units, and have proved entirely successful. But it is in the test of times that the uses of this new light gage steel will prove most effective. They will outlast wood by many years."

Male said an important factor in the economy of steel in housing involved the cost of labor. Factory prefabrication of steel shapes will eliminate much costly manual work.

"Considering all these factors," Male added, "there now exists the opportunity for Americans to build more durably by using both structure and light gage steel in almost every type of construction."

American Can Co. Forms Research And Development Group

New York

• • • **D. W. Figgis**, president of the American Can Co., announced recently that one of the company's two principal manufacturing officers has been relieved of former duties to head a newly-formed Research and Development Department.

James A. Stewart, vice-president, formerly in charge of packers' can manufacture, will devote his full time to the activities of the new department. The objective is to focus all of the company's research, and marketing resources on assistance to canners, packers and manufacturers in connection with new products, new uses of containers and improved processes.

"The company has passed the point of development in its war production activities," Mr. Figgis said, "and in making it possible for Mr. Stewart to devote his entire effort to forward planning, American Can is entering a significant stage in its postwar program.

"Canned beer, canned motor oil and the fibre milk container," he said, "are typical American Can packaging developments which revolutionized marketing of large-volume commodities in recent years. The many new canned ration items that have figured in the soldiers' overseas diet during the war are indicative of what food research can accomplish in a short time."

The company now maintains 58 can manufacturing plants, seven machine shops for manufacture of can manufacturing and closing equipment and 39 sales servicing offices in the United States, Canada and the Hawaiian Islands. Its principal research laboratories are located at Maywood, Ill., with nine branches at other points.

Republic Obtains Licenses for Light Steel Manufacture

Cleveland

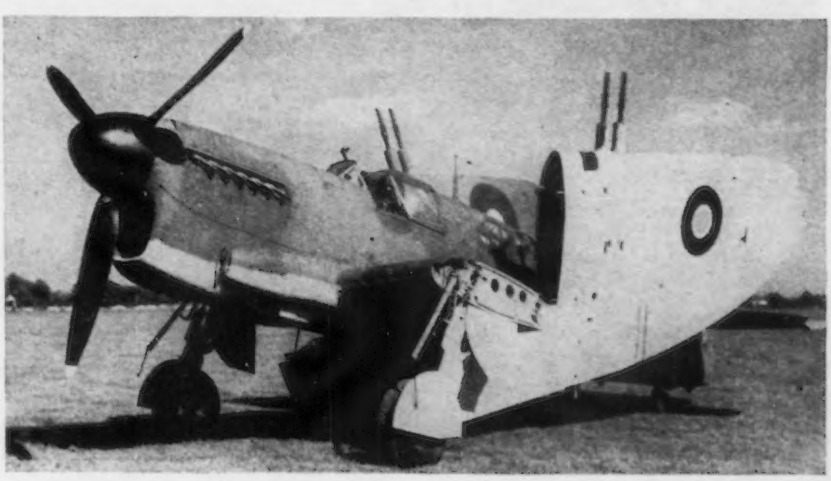
• • • **Republic Steel Corp.** will produce two new lightweight but strong steels in the postwar period, announced N. J. Clarke, vice-president.

Mr. Clarke revealed that Republic had acquired licenses to manufacture "Cor-Ten" and "Aldecor" in addition to its own product "Republic Double Strength Steel" developed some years ago. "Cor-Ten" is a steel patented by Carnegie-Illinois Steel Corp. and other U. S. Steel Subsidiaries. "Aldecor" was developed by the Alloys Development Corp. of Pittsburgh Steel Corp.

"The trend which began several years before the war toward the use of lighter but stronger steels by the transportation industry," Mr. Clarke said, "will accelerate sharply as soon as wartime restrictions on steel production are lifted."

The two new high strength lightweight steels round out Republic's products for use in construction of railroad cars, street cars, busses, and trucks and trailers.

NEW WING ARRANGEMENT: *Wings of the new British fighter-reconnaissance plane are constructed so as to fold back in a parallel position. The low-winged monoplane fitted with four 20 mm. cannon and equipped with a camera for vertical aerial photography, carries a crew of two.*



Canadian Iron and Steel Output Continues Downward Trend in September

Toronto

• • • **Canadian production of** iron and steel continued to move downward in September. Pig iron output at 145,406 tons was at a rate of 62.9 per cent of capacity and compares with 151,452 tons or 65.5 per cent for August and 147,902 tons in September, 1943. Production for the month included 112,817 tons of basic iron, of which 673 tons were for sale and the balance for further use of producing companies; 16,369 tons of foundry iron and 16,220 tons of malleable iron, all the latter two grades being for sale. Throughout the month eight furnaces were in blast out of a total of 14 stacks in Canada.

For the first nine months of the year pig iron production totalled 1,412,385 net tons, a gain of 9.4 per cent over the 1,331,966 tons reported for the corresponding period of 1943, and compares with the all-time high record of 1,464,631 tons produced in the 1942 period.

In September output of ferro-alloys amounted to 14,568 net tons, which compares with 18,808 tons in the previous month and 17,007 tons in September a year ago. The following alloys were produced: Ferrosilicon, silicomanganese, ferromanganese, ferrochrome, chrome-x, and ferrophosphate. For the nine months ending with September, Canada produced 139,126 net tons of ferro-alloys, compared with the all-time record of 168,637 tons in the same period of 1943 and 159,070 tons in 1942.

Production of steel ingots and castings during September totalled 242,725 net tons which is an average rate of 81.1 per cent of capacity and compares with 246,755 tons or 82.4 per cent in the month immediately preceding and 241,255 tons in September, 1943. During September output included 231,292 tons of ingots and 11,433 tons of castings. For the nine months ending with September cumulative production of steel ingots and castings was 2,236,481 net tons and compares with 2,237,736 tons in the 1943 period and the all-time record of 2,309,588 tons in 1942.

Norman W. Foy Is Expected To Resign; Returning to Republic Steel

Washington

• • • **Steel Division Director** Norman W. Foy is expected to resign within the next 30 days to return to the Republic Steel Corp. where he was general manager of sales before coming to WPB. Mr. Foy, who refused to comment upon reports of his resignation, was the ninth man to become chief of the Government's war steel unit, figuring back to the National Defense Advisory Commission.

It is expected that William B. Todd, deputy director, will succeed Mr. Foy. Mr. Todd was formerly with the Steel Export Association in Britain, a member of the Harriman Mission, and at one time was vice-president in charge of sales for the Jones & Laughlin Steel Corp.

In Mr. Foy's three years of duty in Washington he held the following Steel Division posts—executive consultant, vice-chairman of the Steel Division Requirements Committee, assistant director in charge of programs and distribution, deputy director, and finally, director.

A leading figure in devising the steel quota plan which later became CMP, Mr. Foy collaborated with executive consultants, Charles Longfield, of the Youngston Sheet & Tube Co., and Joseph L. Block of the Inland Steel Co. in the formulation of CMP, contributing much toward the steel distribution system that finally worked.

GET READY BOYS: *As their American aircraft carrier enters a combat zone, crewmen trundle 500-lb. bombs toward a group of dive bombers before taking off on an attack on Japanese installations.*

Official Definition Of "Scrap" Altered

Washington

• • • **OPA on Monday** changed the definition of scrap contained in the regulation covering special sales of industrial materials to include all material defined as "scrap" by any other regulations. Previously "scrap" was defined as "waste or by-product of any kind of fabrication or manufacturing operation." This definition did not include surplus industrial materials.

As a result of OPA's action, however, if a person wishes to buy surplus industrial materials for use as scrap, he must pay the maximum scrap prices for them.

Battlefield Scrap Not To Be Returned From Overseas by Army

Washington

• • • **The War Department** last week announced that battlefield scrap iron and steel no longer will be returned from overseas theaters, and that theater commanders have been directed to assemble and store ferrous scrap for shipment or disposal as required.

The Department gave several reasons for halting overseas shipment of scrap. It said that the supply in this country has improved to such an extent that dealers have been storing recent purchases; that additional tonnages will be available as the result of contract terminations; that the quantity of ferrous scrap returned the past year amounted to only one-fifth of 1 per cent of the steel consumption and, finally, that considerable labor was involved, with delays in shipping time resulting in some cases.

Property Classification Depots for handling excess, reclaimable and scrap materiel returned from overseas are being set up at Fort Eustis, Va.; Fort Dix, N. J.; Fort Lewis, Washington, and Camp Beale, Cal. Function of the Property Classification Depots will be to classify unidentified materiel and ship what is excess and reclaimable to the appropriate depot or shop for reissue or repair. Returned scrap will be sold directly to dealers and consumers.

Slight Easing in Rolled Sheet and Copper Reported in WPB

Washington

• • • **While emphasizing that** no immediate relaxation of restrictions on production of metal furniture and fixtures is contemplated, WPB officials at recent meetings with industry advisory committees reported a slight easing of the hot and cold-rolled sheet as well as of the copper situation. The situation regarding these products was outlined at a meeting of the Safe and Insulated File Industry Advisory Committee and at a joint meeting of the General Metal Office Furniture, Visible Record Equipment and Shelving and Locker Industry Advisory Committees.

WPB officials said that prompter delivery of "Z" (deferred) allotments of some types of steel may be expected in the future and that while copper is not so critical as previously, conservation of the available supply of refined copper must be continued to assure that military requirements can be met. They explained, however, that very limited quantities of copper released as a result of military cutbacks are being made available for the more essential civilian production. They said that the copper order, M-9-c, is expected to be revoked on V-E Day. Committee members recommended that M-9-c be amended prior to V-D Day to permit the use of brass and bronze for sales, insulated files and safety deposit boxes.

The possibility of using hard aluminum sheets for office and industrial furniture and equipment was suggested by WPB representatives. "Z" allotments could be assigned for this purpose by WPB, they said.

The current status of other materials and components used by the industries was outlined by WPB officials as follows:

Bearings less than 30 mm. outside diameter, are now more readily available, but larger bearings are still critical. Steel balls less than ½ in., outside diameter, are very critical. No hope was held out for the availability of chrome for plating in the near future. Most of the nickel currently being produced is used for direct war purposes, and none is available for the industries represented by the committees.

Committee members requested that WPB permit manufacturers to order materials in advance of reconversion to permit a quick shift from war production and maintenance of employment.

Die Casters Get Army Ordnance Recognition

New York

• • • **The American Die Casting Institute** has been awarded the Ordnance Distinguished Service Award in recognition of its contribution to the war effort. Maj. Gen. L. H. Campbell, Jr., Chief of Ordnance, notified the Institute that it has been honored with the Distinguished Service Award of the Ordnance Department because of "outstanding contributions to Ordnance progress in the war."

General Campbell specifically noted the "scientific and engineering achievements" of the die casters according to David Laine, associate secretary of the Institute.

TAKE A LESSON: *A U. S. Lieutenant, with the aid of an interpreter, explains a tactical situation on a large scale model to soldiers of a Chinese Army Division as part of the training given Chinese troops in modern warfare by the Y-Force operations taff.*

U. S. Steel Reports Finished Products Shipment of 5,231,612 Tons

New York

• • • **For the third quarter** of 1944, the United States Steel Corp. shipped 5,231,612 net tons of finished steel products, Irving S. Olds, chairman, announced at the corporation's third quarterly meeting. For the first nine months of the year, shipments totaled 15,864,466 net tons, an increase of 794,822 net tons over the same period of 1943. This tonnage was the largest shipped in any first nine month's period in the corporation's history, the previous record being 15,761,476 net tons shipped in the same period of 1942.

Production of steel ingots and castings in the third quarter of 1944 averaged 93.3 per cent of rated capacity and for the nine months ended Sept. 30, such production averaged 95.1 per cent. The current drop in the ingot operating rate is due to the lack of suitable manpower and to the decreased demand for bessemer steel.

During the third quarter, 152 work stoppages took place which are estimated to have resulted in the loss of 172,000 tons of steel and 78,000 tons of coal. These figures are lower than those for the second quarter. From Jan. 1 to Oct. 27 there was a total of 467 work stoppages involving 1,561,268 manhours, and resulting in a loss of 274,000 tons of coal and 710,000 tons of steel. This compares with 493 work stoppages for the entire year 1943 with losses of 3,736,000 manhours, 2,183,000 tons of coal, and 224,000 tons of steel.

Income for the third quarter of 1944, after all costs, including allowances for estimated excess profits taxes, but before declaration of dividends, amounted to $16,924,356. Income for the first nine months of 1944 was $49,306,889. The quarterly dividend were set at $1.75 a share for preferred stock and $1.00 a share for common stock.

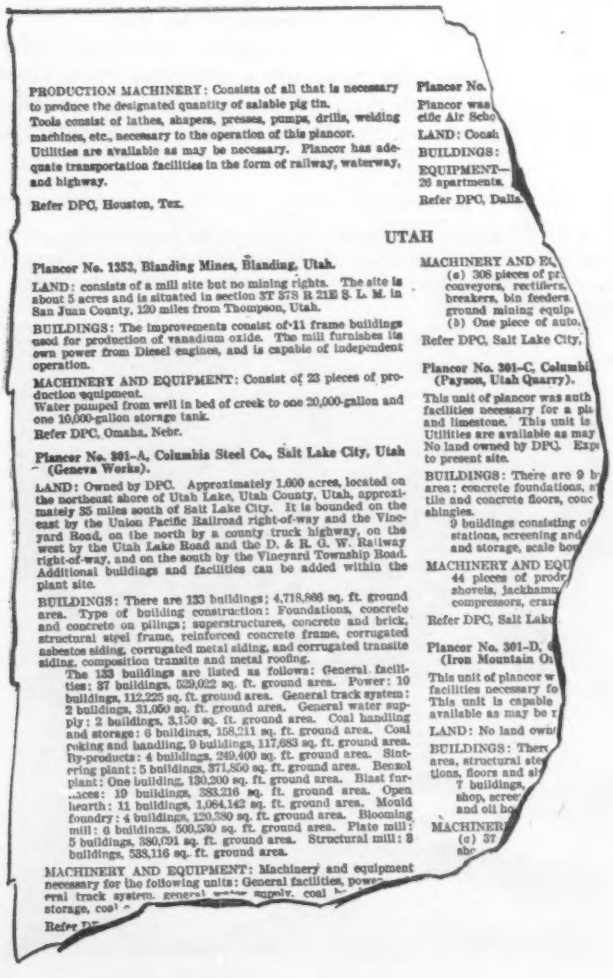
Products and services sold in the first nine months of 1944 were $89,100,000 more than during the comparable period of 1943.

South American Exports Simplified

Washington

• • • **Effective Jan. 1,** iron and iron products, non-ferrous metals, miscellaneous minerals and chemicals will be removed from FEA's decentralization procedure, which requires exporters to submit preference request recommendations with applications for licenses to export to Brazil. The only commodities for which Brazilian preference request recommendations must accompany license applications after that date are carbon and alloy steel, coal, coke, wood and wood manufactures and rubber products. These and other commodities will also still require import recommendations from most other Latin American countries.

In a bulletin to exporters notifying them of the removal of additional groups from the decentralization procedure, FEA pointed out that commodities no longer requiring preference request recommendations will "continue to be subject to quantity and other limitations of the War Production Board and other agencies." It was also pointed out that the removal of the commodities from the decentralization procedure does not mean necessarily that they are in free supply nor that they may be exported without an export license.



PRODUCTION MACHINERY: Consists of all that is necessary to produce the designated quantity of salable pig tin. Tools consist of lathes, shapers, presses, pumps, drills, welding machines, etc., necessary to the operation of this plancor. Utilities are available as may be necessary. Plancor has adequate transportation facilities in the form of railway, waterway, and highway.

Refer DPC, Houston, Tex.

UTAH

Plancor No. 1353, Blanding Mines, Blanding, Utah.

LAND: consists of a mill site but no mining rights. The site is about 5 acres and is situated in section 37 S 23 R 21E S. L. M. in San Juan County, 120 miles from Thompson, Utah.

BUILDINGS: The improvements consist of 11 frame buildings used for production of vanadium oxide. The mill furnishes its own power from Diesel engines, and is capable of independent operation.

MACHINERY AND EQUIPMENT: Consist of 23 pieces of production equipment.
Water pumped from well in bed of creek to one 20,000-gallon and one 10,000-gallon storage tank.

Refer DPC, Omaha, Nebr.

Plancor No. 301-A, Columbia Steel Co., Salt Lake City, Utah (Geneva Works).

LAND: Owned by DPC. Approximately 1,600 acres, located on the northeast shore of Utah Lake, Utah County, Utah, approximately 35 miles south of Salt Lake City. It is bounded on the east by the Union Pacific Railroad right-of-way and the Vineyard Road, on the north by a county truck highway, on the west by the Utah Lake Road and the D. & R. G. W. Railway right-of-way, and on the south by the Vineyard Township Road. Additional buildings and facilities can be added within the plant site.

BUILDINGS: There are 133 buildings; 4,718,866 sq. ft. ground area. Type of building construction: Foundations, concrete and concrete on pilings; superstructures, concrete and brick, structural steel frame, reinforced concrete frame, corrugated asbestos siding, corrugated metal siding, and corrugated transite siding, composition transite and metal roofing.
The 133 buildings are listed as follows: General facilities: 37 buildings, 529,022 sq. ft. ground area. Power: 10 buildings, 112,225 sq. ft. ground area. General track system: 2 buildings, 31,050 sq. ft. ground area. General water supply: 2 buildings, 3,150 sq. ft. ground area. Coal handling and storage: 6 buildings, 158,211 sq. ft. ground area. Coal coking and handling, 9 buildings, 117,683 sq. ft. ground area. By-products: 4 buildings, 249,400 sq. ft. ground area. Sintering plant: 5 buildings, 371,850 sq. ft. ground area. Benzol plant: One building, 130,200 sq. ft. ground area. Blast furnaces: 19 buildings, 383,216 sq. ft. ground area. Open hearth: 11 buildings, 1,084,142 sq. ft. ground area. Mould foundry: 4 buildings, 120,380 sq. ft. ground area. Blooming mill: 6 buildings, 500,530 sq. ft. ground area. Plate mill: 5 buildings, 380,091 sq. ft. ground area. Structural mill: 3 buildings, 533,116 sq. ft. ground area.

MACHINERY AND EQUIPMENT: Machinery and equipment necessary for the following units: General facilities, power, general track system, general water supply, coal handling and storage, coal

Refer DP

Plancor No.
Plancor was
cific Air Sch
LAND: Consi
BUILDINGS:
EQUIPMENT—
26 apartments.
Refer DPC, Dalla

MACHINERY AND E
(a) 308 pieces of pr
conveyors, rectifiers,
breakers, bin feeders
ground mining equip
(b) One piece of auto

Refer DPC, Salt Lake City,

Plancor No. 301-C, Columbi
(Payson, Utah Quarry).

This unit of plancor was auth
facilities necessary for a pla
and limestone. This unit is
Utilities are available as may
No land owned by DPC. Exp
to present site.

BUILDINGS: There are 9 b
area; concrete foundations,
tile and concrete floors, conc
shingles.
9 buildings consisting o
stations, screening and
and storage, scale hou

MACHINERY AND EQU
44 pieces of prod
shovels, jackhamm
compressors, crai

Refer DPC, Salt Lake

Plancor No. 301-D,
(Iron Mountain Ou

This unit of plancor w
facilities necessary fo
This unit is capable
available as may be r

LAND: No land own

BUILDINGS: There
area, structural ste
tions, floors and sl
7 buildings,
shop, screen
and oil ho

MACHINERY
(a) 37
sho

ADD WESTERN STEEL: *Recently published by the RFC is a book listing all DPC facilities which will be for sale after war production has ceased. Plants are briefly described, and the quantity of equipment in use is disclosed. Among the entries worthy of note is the listing of "Plancor" No. 301-A, Columbia Steel Co., Salt Lake City, Utah (Geneva Works). RFC belatedly pointed out that mere listing of the plants for sale at the present time does not mean that DPC plans to sell out from under any firm in war production.*

Chevrolet Forgings Plant Beats Capacity

Saginaw, Mich.

• • • **The aluminum forge** plant of the Chevrolet Motor Division of General Motors Corp. has produced and shipped more than 100,000,000 lb. of aluminum forgings during the past 22 months. Shipments have averaged 4,500,000 lb. per month for the period, against a rated capacity of 4,000,000 lb.; the largest single month's production exceeded 6,400,000 lb.

The facilities at Saginaw, owned by the Defense Plant Corp., went into operation Dec. 7, 1942, with first shipments made two weeks later. Products include aircraft propeller forgings and other good-sized sections.

Commons Receives Report On German Resources Losses

New York

• • • **Germany has recently** lost the manufacturing capacity for over 20 million tons of pig iron, and almost equal steel furnace capacity, according to official British figures quoted in the House of Commons recently.

This would amount to about 40 per cent of the steel furnace capacity available earlier in the year, and about 45 per cent of the pig iron capacity formerly available. It was also disclosed that iron ore supplies have been reduced by 65 per cent compared with 1943.

Mr. Dingle Foote, Parliamentary secretary to the Ministry of Economic Warfare also revealed the following figures on other metal resources:

Copper: Total intake of new metal reduced by about 60 per cent.

Lead: By the loss of Yugoslavian and other Balkan mines, supplies have been reduced by approximately 40 per cent, and the position has been weakened by the loss of substantial amounts of scrap metal which were being collected in France, Belgium and the Netherlands.

Chrome: Recent events in Yugoslavia appear to have brought to a standstill all rail traffic into Germany, thus depriving the enemy of his entire supplies of chrome, which since the loss of Turkish output, have all been acquired from Yugoslavia, Albania and Greece.

Molybdenum: Loss of ores from Finland, Greece and Yugoslavia represent about two-thirds of total supplies.

Bauxite: The high-grade deposits in the south of France are believed to have furnished 40 per cent of German supplies, while the French aluminium industry accounted for 15 per cent of the total aluminium produced in German Europe. With the seizure by Marshal Tito's forces of the island fringe of Yugoslavia, the enemy's total loss of bauxite appears now to exceed 50 per cent.

Cobalt: Shipments from Finland represented the sole German external source of supply and constituted about 80 per cent of the total quantity with which the enemy has sustained that part of his synthetic oil production obtained by the Fischer-Tropsch process.

Wolfram: Under the agreement negotiated by Britain and the U. S. with Spain earlier this year, it was still open for the Germans to obtain small monthly consignments from Spain. These have now been cut off, together with any appreciable possibility of smuggling wolfram from the Iberian Peninsula.

Terminations Await Claim Filing by Contractor in Many Cases

Washington

• • • **Failure of war** contractors to submit claims to it upon termination of contracts has put the War Department in the cartooning business to increase awareness of the need for taking preparatory steps—putting settlement machinery into motion—as the tempo of contract termination increases. The cartoons show Uncle Sam reminding remiss contractors what to do when contracts are terminated and how to proceed for their quick settlement.

The War Department's inspiration for visualizing by humorous but pertinent drawings its desire for early liquidation of claims came from the fact that a great majority of the 4000 contractors remaining unsettled out of 28,000 terminated, are hanging fire because the affected contractors have not submitted their claims.

It is the hope of the War Department through the continuing use of graphic reminders, such as cartoons, through constant references to the subject in business papers and the daily press and through the efforts of local contracting officers that the importance of preparation for termination and the prompt submission of claims can be brought home to all manufacturers with war contracts.

It was pointed out that there are a number of steps that a contractor or subcontractor can take to prepare himself for contract termination.

The War Department listed the following steps, all of them going under the head of pre-termination planning:

He can avail himself of all publications (such as *The Contractor's Guide*) that explain termination procedures. Copies of these publications are available from his local contracting officer.

He can delegate a member of his organization to check government regulations on the subject of contract termination.

He can keep in close touch with his local conracting officer, especially on those individual problems that may exist in his particular organization.

He can set up a termination group within his own company.

Thompson Employee Survey Points Toward Better Labor Relations

Cleveland

• • • **Results of an** employees' survey made sometime ago by Thompson Products, Inc., and Thompson Aircraft Products Co. have been made public, along with word from Frederick C. Crawford, president, that "many of them have already made their influence constructively felt in relationships between men and management."

The polls were conducted among 16,000 salaried and hourly rated employees, of which 12 per cent were negroes and 32 per cent women. The questionnaires distributed by the company were to be returned unsigned. Inasmuch as results in the two corporate setups ran parallel, they were combined. Of those answering the questions, 60 per cent rated their jobs "fine." A proportion of four per cent said they did not like their jobs, and their reasons were varied — too low pay, failure to utilize highest employee's skill, dislike of factory work, dislike of the boss, and others.

Answers on division of profits indicated wide variance. Fifty-one per cent of the employees felt that profits on a hypothetical mining venture, clearly illustrating the varied interests of labor and capital, should be divided on a 50-50 basis. One question dealt with rate of return deemed reasonable from investment in company stock; a rate of 6 per cent was expected by 31 per cent of the employees, while some specified as much as eight and ten per cent. A proportion of 88 per cent said the division of company income in 1942 (94.2c. to employees, 4.4c. reinvested in the business, and 1.4c. as dividends to stockholders) was fair.

On the question of working hours, the overwhelming majority voted in favor of an 8 hr. day with 30 min. lunch period.

Criticism of company policy on promotions was evident. Only 40 per cent of those replying thought the company selected the best qualified people for promotion, although 52 per cent said this was true "part of the time." The remainder said "almost never."

Questions on postwar operations provoked a variety of interesting responses. Hopes of staying with the company after the war were expressed by 85 per cent. Married women, 79 per cent said should not be employed after the war except in cases of dependency. Only seven per cent expected to leave Cleveland after the war.

Interest in company publications was obvious. Seventy per cent of the respondents had received a copy of the last annual report, and 86 per cent of these said they found it interesting and understandable, while 89 per cent wanted to continue to receive the report. Regular reading of company bulletins was reported by 77 per cent and 78 per cent said they were getting the kind of company information they desired. A total of 35 per cent took part in company sponsored athletic or social activities.

One question concerned time available in the cafeteria at lunch and what to do with it. The overwhelming majority in all plants preferred a soft musical background, not more than two or three minutes of headline news, and occasional floor shows.

Immediate Sale of All Postwar Surpluses Is Recommended

Chicago

• • • **With a domestic** economy employing 55 million persons, disposal of surplus war property can be made immediately, Dr. A. D. H. Kaplan, University of Denver professor and author of studies on property liquidation for the Committee for Economic Development, declared here recently before the Central Supply Association.

Of an outside total of surplus civilian type goods of $15 billion, $9 billion will be in foreign countries.

"When we eliminate from that total the clothing and personal equipment, textiles and other soft goods; the motor vehicles, parts, and accessories; the food stuffs on hand in domestic storage, and the government stock piles of so-called critical raw materials, then we have a remaining surplus inventory of possibly $2 billion in producers' and consumers' durables," he declared.

"This conglomerate of durables covers machines, tools, hardware, engineering equipment, railroad equipment, chemicals, and portable communications apparatus."

Citing previous experience, he urged that this material be put on the market immediately "when the consumer is in the buying mood," declaring that "cost of prolonged storage and record keeping far more than outweighed the advantage of holding stock for a higher price."

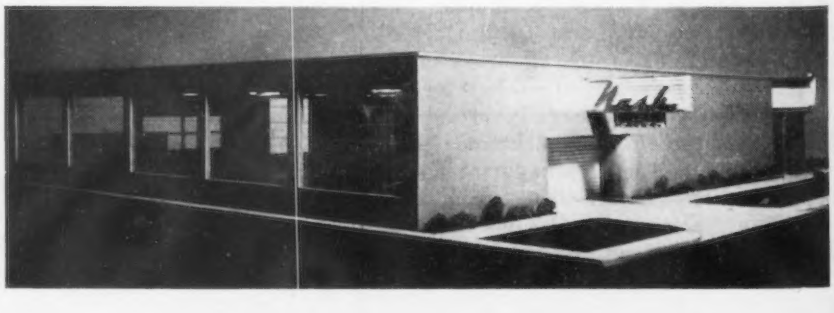
Wage Adjustment Will Await Price Relief

Racine, Wis.

• • • **Approval has been** given by the Sixth Regional War Labor Board to portions of a joint application for wage adjustment by Standard Foundry Co., Racine, and United Automobile Workers, Local 60.

Approval was given to modified hourly rates for various job classifications, an increase of 5c. an hr. in hourly earnings of piece workers, and a nightshift premium of 5c. per hr. Because the company stated that the wage increases would be the basis for an application for price relief, the WLB ruling will not become effective until finally approved by the Office of Economic Stabilization.

STYLE AIDS: *Designs and aid in building modernly styled retail sales outlets are being offered to dealers by the Nash Division of Nash-Kelvinator Corp. Rcommended buildings can be erected new, or developed by conversion of existing facilities.*



Claims Proposed Manpower Control Exemptions Open to Argument

Washington

• • • **Smaller War Plants Corp.** Director Maury Maverick said on Nov. 2 that the proposed exemption from manpower controls of plants employing 100 employees or less has reached the "argument" stage. It is reported that the exemption order which at the same time holds down Pacific Coast concerns to a level of 50 employees or less is now awaiting WPB Chairman Krug's signature.

Mr. Maverick said that he could not see any reason for freezing employees in one part of the country where labor is plentiful because there is a shortage in another part of the country. He said that it would be silly to keep 2,000,000 to 3,000,000 out of work under this reasoning.

It is generally agreed, Mr. Maverick said, that if this exemption on spot authorization is approved, it will nullify the Byrnes Directive of Aug. 4 which reposes in the War Manpower Commission the authority to turn reconversion applications down on the ground of manpower shortages.

Other WPB sources report that the War Department is opposed to the order and that this is the thing that is holding up WPB's approval. The War Department says that "must" programs would suffer if the exemption order were approved before X-Day, it is alleged.

While much ballyhoo has been released by WPB about the spot authorization plan, government officials who have maintained close contact with industry do not report much enthusiasm among business men.

Manufacturers have complained that there is too much red tape, too many forms to fill out, too many questions to answer that are irritating when the subject of the application should be very little concern to the government.

Besides, critics allege that the steel reserve established for the fourth quarter is so small (only about 125,000 tons) and the approvals have so slowed up in the month of October, that the spot authorization plans operation so far is insignificant. About 50,000 tons of steel have been allotted.

Approximately 90 per cent of all turndowns on "spot" authorizations was on manpower grounds and when denials were 20 per cent of all applications the weekly value of approvals amounted to $17,000,000. For the week ended Oct. 24, denials amounted to 24 per cent of all applications and the weekly rate declined to $13,000,000.

The WMC seems to have withdrawn its objections to the exemption from manpower requirements for small firms, but the War Department evidently reflecting the belief that the European War will extend through the winter still objects to this relaxation. WPB thinks that this is a good reason for permitting the exemption to cushion the unemployment effects of X-Day cancellations.

The chances are, WPB officials report, that the War Department supply shortages and full war production will continue right up to X-Day, so that there will never be a time when the Army feels that it will be right to reconvert until X-Day. Mr. Krug, who has a plan for X-Day order relaxations, is holding it up until he gets the green light from the White House. Observers say that he is much more likely to be affected by Army and Navy thinking on this battleground than either Donald M. Nelson or Charles E. Wilson were because of the fact that he is to all practical purposes still in the Navy and does not have the background of what went on before between the former WPB heads and War Department representatives.

The MRO order which would have permitted manufacturers to divert surplus-allotments received for maintenance, repair and operating supplies to use materials for production of tools, dies and fixtures for reconversion is still being held up in the Clearance Committee.

An automobile industry proposal that controls on automobile parts and components be put under the spot authorization plan is receiving consideration but seems stymied.

Although the Detroit regional office has reported that there are about 300 independent engineers which could be utilized by industries which want to do pre-reconversion specification planning, WPB has indicated that it does not want to release more engineers to do postwar engineering than have already been released because of War Department fears of public reaction "that the war is over" and labor evaporation and job hopping in anticipation of X-Day.

In all the straining of gnats over reconversion, WPB got the War Department to swallow a camel in amendment to L-48 last week which permits aircraft manufacturers to reconversion changes on military aircraft models to conform to the CAA specifications. Not only was this permitted, but aircraft trade sources here think that the order goes a great deal further to permit the industry to do actual retooling against X-Day plans.

Although War Department officials are still talking about a 200,000 employee manpower shortage, informed trade sources say that the actual shortage is 12,000 unskilled laborers in "must" programs such as heavy tires, trucks, artillery and ammunition.

Another factor said to be delaying reconversion is the report that the President and Prime Minister Churchill agreed to hold up American reconversion until Britain could reconvert. When SWPC Chairman Maverick returned from England he advocated synchronization of British and American reconversion, for the reason that England wouldn't be a good tool market if we used up our tool making capacity in reconverting first.

M-24 LIGHT TANK: *The U. S. Army's new light tank, the M-24,* (IRON AGE, *Nov. 2, p. 101*) *mounts a 75 mm. cannon, travels on a special wide trackage to improve mobility on soft terrain.*

Herbert W. Graham to Go With Nelson to Set Up Chinese WPB

Washington

• • • **WPB Chairman** Donald M. Nelson will go to China the last part of next week to improve that nation's war production by creating a Chinese WPB. The announcement was made by the White House on Nov. 2 and it was said that Mr. Nelson would be accompanied by Herbert W. Graham, Director of Research and Metallurgy for the Jones & Laughlin Steel Corp., and four other steel men, who have not been named yet.

Howard Coonley, Walworth Co. president and WPB executive, has been described as the "Charles Wilson" of the expedition. Mr. Coonley was selected by the President, it is reported, because the Chinese Government has great admiration for the National Association of Manufacturers and Mr. Coonley is a former president of that organization. Mr. Coonley is expected to remain in China indefinitely.

Mr. Nelson is expected to return to the United States shortly after the organization job is done. WPB spokesmen say that steelmen will try to increase China's output from existing facilities through improving mill practices.

China's steel output was said by one WPB official to be 12,000 tons a year. The Chinese WPB will attempt to stretch this tiny output into all the places steel is needed to fight the Japs. It is also reported that the expedition will survey raw materials and mill sites for postwar construction of a much larger steel industry. This would require American materials, equipment, engineering and skilled labor.

Who is to pay for this expenditure it has not been disclosed, but steelmen here estimate that it will take 30 years to build an adequate industry for China, presupposing that the nation has all of the requisite raw materials.

Baldwin Completing Big Ship Propellers

Philadelphia

• • • **The fifth of** a half-dozen giant ship propellers, largest ever built in America, is nearing completion in the Cramp Brass and Iron Foundries Division of Baldwin at Philadelphia for installation in the largest ore and cargo vessels ever built in this country, according to J. J. Nelson, vice-president of Cramp Brass.

The propellers, cast in cement molds, are 22 ft. in diameter and weigh about 70,000 lb., 30 per cent more than the largest previously built in this country. Bronze for the sixth propeller already has been poured and its delivery to the shipbuilder will follow speedily, Nelson said.

The four-bladed propellers each have 202 sq. ft. of area. They are solid bronze and develop 11,000 shaft hp.

The ships to utilize the propellers are to be combination ore and oil carriers which will serve during the war, then be converted to peace transport. Steering gears of tremendous size also were designed and manufactured for the vessels by Baldwin in its Southwark Division, also at Philadelphia.

Vulcan Detinning Purchases Detroit's Collected Tin Cans

Detroit

• • • **Vulcan Detinning Co.** of Sewaren, N. J., has purchased an estimated 1000 long tons of prepared tin cans expected to be gathered in Detroit Nov. 13, at a price of $16.15 per ton less freight charges, the same price paid for previous collections. The City of Detroit will pay freight charges of $4.66 a ton to Neville Island, Pa. One other bid was entered, but was lower than the net price of $11.49.

Vulcan declined to commit itself on two future collections on which bids were sought, reporting, according to a city purchasing agent, that "the bottom is about to fall out of the market for salvaged materials that are recovered from tin cans."

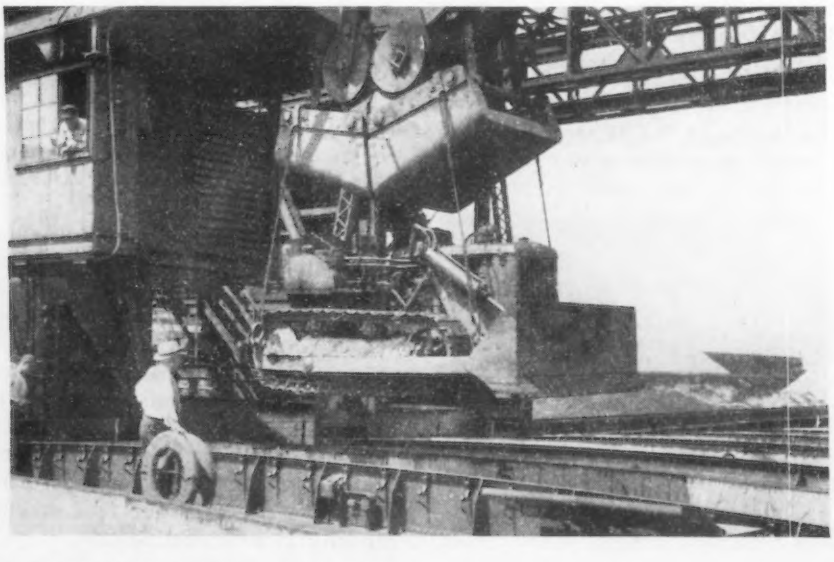
The agent, Ernest Jones, said Vulcan officials declared they expected the government would subsidize firms engaged in tin can salvage work in the future.

Canada to Build Cargo Vessels for Coastal Trade

Ottawa

• • • **The Department of** Munitions & Supply announced that contracts have been let to Canadian ship builders for 16 coastal cargo ships of 350 tons to be built for Wartime Shipbuilding Ltd. on behalf of the British Ministry of War Transport. The ships will be steel-hulled with an 8½ ft. draft and length of 140 ft. and will serve as all-purpose cargo carriers in the Pacific. Four of the ships will be built by Geo. T. Davie & Sons Ltd., Lauzon, Quebec; four by Morton Engineering & Drydock Co. Ltd., Quebec; five by North Van Ship Repairs Ltd., Vancouver, and three by Victoria Machinery Depot, Victoria, B. C. The vessels will cost $450,000 each and be completed in the latter part of 1945.

LOWER AWAY: *Caterpillar Diesel D6 Tractor equipped with LaPlant-Choate bulldozer is lowered into the hatch of an ore boat of the Interlake Steamship Co.'s fleet at the dock of the Youngstown Sheet & Tube Co.'s Indiana Harbor Works, East Chicago, Ind.*



Six New Manufacturing Lines Scheduled for 155 mm. Shells

Chicago

• • • **Scheduled mass production** of 155 mm. shell by six new manufacturing lines will more than triple the current production rate of this size ammunition in the Chicago Ordnance District within four months, Col. John Slezak, district chief, has announced.

Three of the new lines will begin feeding the Army's "Long Tom," before the end of the year, and the remaining three will start either late this year or early in 1945. Operators of the new lines are Florence Stove Co., Kankakee, Ill.; Mueller Co., Decatur, Ill.; Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.; Minneapolis-Moline Power Implement Co., Minneapolis, Minn.; National Can Co., New Brighton, Minn.; and W. F. & John Barnes Co., Rockford, Ill.

John Nuveen, Jr., regional War Production Board chief, revealed last week that this region was the heaviest producer in the heavy artillery ammunition program. Colonel Slezak supplemented his announcement on 155 mm. shell production with a statement that shell for 4.5-in. guns and 8-in. howitzers are being produced in the Chicago Ordnance District for the first time. He stated that Altorfer Brothers Co., of Peoria, Ill., produced an initial lot of 4.5-in. shell in October, and that Batavia Metal Products, Inc., of Batavia, Ill., also delivered its first 8-inchers last month.

The nation's largest production line for 105 mm. howitzer shell will go into production early in 1945 at the old Twin Cities Ordnance Plant, New Brighton, Minn., under an International Harvester Co. contract.

In the third quarter of 1944, the Chicago Ordnance District produced $116,127,078 worth of shell and other ammunition components, representing an increase of 6 per cent over the second quarter production of $109,345,679. New contracts for ammunition awarded in the six months period ended Sept. 30 in the district amounted to $354,700,720.

Gray Iron Founders Request Re-rating Of Urgent Programs

Washington

• • • **Members of the** Gray Iron Foundry Industry Advisory Committee last week told WPB that in order to expedite casting production a rating higher than AA-1 should be assigned to urgent military orders needed on "hot" programs and said that such programs should be clearly identified.

Lack of manpower was said by committee members to still remain as the chief cause of insufficient production. At the same time the Government presiding officer said that the industry must put forth added effort to satisfy the demand for castings for the heavy truck, tank and heavy ammunition programs.

Tentative September production figures, a WPB official reported, are slightly under those of August, whose output of gray iron castings exceeded 778,000 tons, the second best production month in 1944.

Scrap losses and rejections were said to be higher than in prewar periods.

Discussing reduction in war production, WPB representatives said that conversion will not constitute a problem and that after V-E Day the board will help the industry by maintaining and utilizing its power only when and where necessary. It was added that a large potential demand exists for foundry equipment to be released on removal of priority requirements.

Complaint was made that visits to foundries by representatives of armed forces and Government agencies are excessive and consume too much time.

Restrictions on New Steel Drums Altered

Washington

• • • **New steel drums** of more than 12 gal. capacity may be accepted by shippers until Jan. 29, for packing certain bulk foods for which the use of this type of container has been forbidden, WPB announced on Nov. 2. However, the acceptance of the drums is subject to the 60-day inventory restriction of L-197, the steel drum order.

WPB issued Direction 2 to L-197 in order to utilize the improved steel supply to permit the use of a quantity of new steel drums for a limited period to pack certain commodities that have been denied their use for more than two years.

Products granted new steel drums under provisions of the direction appear on Schedule B of L-197 as item numbers: (26) certain solid and semi-solid compounds used in cooking such as (47) lard; also (29) dairy products (32) cold pack and frozen food products; (42) certain hydrogenated oils, such as shortening (44) jellies, jams, and preserves (54) molasses; (89) and (90) syrups.

The total weight of new drums used for the foregoing products for industrial orders must not exceed 25 per cent of the weight of new steel drums used for the same purposes in 1941. Packers of the products specified in the direction who have entered the field since the base year may apply to the WPB for a quota.

STRANGE CARGO: *A tank rumbles down a ramp from a new Army C-82 transport. The cargo plane carries in its capacious hold heavy weapons and equipment for men on the fighting lines.*

Postwar Battle Looms On Aluminum Killed Price Differential

By S. H. BRAMS

Detroit

• • • **An extra charge** of $5 per ton on medium gages of aluminum killed steel, used primarily for deep drawing sheets, appears to have established itself fairly well in Detroit for the period of war production. Inasmuch as Detroit is still the largest buyer of sheets, even though its purchases have dwindled to fractions of ordinary peacetime automotive requirements, the general success in obtaining the extra has heartened steel men, though some are doubtful of the ultimate effect of the rise.

This is because a few companies which have accepted the extra have done so with the outspoken understanding that they do not consider the matter a closed issue, and intend to bring it up again at some future time —by inference, the time when passenger car production will once more be allowed.

When that day comes, a severe test of the price level may occur. On the one hand the automobile companies will take the position that back in the prewar days they never paid such an extra, that the mills should be able to deliver deep-drawing sheets of the same quality as prewar, and that after all there is no way of their being able to tell whether they are getting aluminum killed steel or simply ordinary low carbon deep drawing sheet.

On the other hand, the steel companies—intent on obtaining the extra now and making it stick in the future —will point out that the residual alloys likely to be present in steel for some time after the war make stabilizing of the metal an absolute necessity if breakage in deep drawings is not to rise to prohibitive levels. In this position they will have practical proof to back them up, because purchasers of non-stabilized steel may find breakage in unprecedented proportion. Of course, at that point any mill able to furnish a better quality unstabilized sheet than others, one which withstands deep drawing without undue breakage, will have a competitive advantage over the others, an advantage which has in it the innate possibility of undermining the extra price.

The extra is $5 on sheet of 13 to 21 gage, $3 for 12 gage and heavier, and $7 for 22 gage and lighter. The first mills to apply it, after official authorization late this summer, have now been charging it for about two months. Recently it began to appear on the billings of the few companies which were reluctant to charge it and which evidently were waiting to watch the experiences of others. Steel users have mostly come into line, although protests are still being heard at a few points.

SUPPLY DEPOT: *Landing craft of various sizes and types are nosed into the beach at Leyte Island, Philippines, unloading men and materiel for the use of Gen. MacArthur's forces in the campaign of that island.*

Alloy Branch WPB's Steel Division Is Dissolved by Foy

Washington

• • • **Demobilization of WPB's** Steel Division, pointed out in THE IRON AGE of Oct. 19, is continuing. Division Director Norman W. Foy on Nov. 1 announced that the alloy branch had been dissolved because the requirements for alloy steel do not nearly equal the available supply and the need for the branch had therefore disappeared. Functions of the branch have been assigned, according to the particular product involved, to the division's various product branches and processing of the alloy melt schedule, which Mr. Foy said will be continued for the time being, will be carried on under the Division's metallurgical branch.

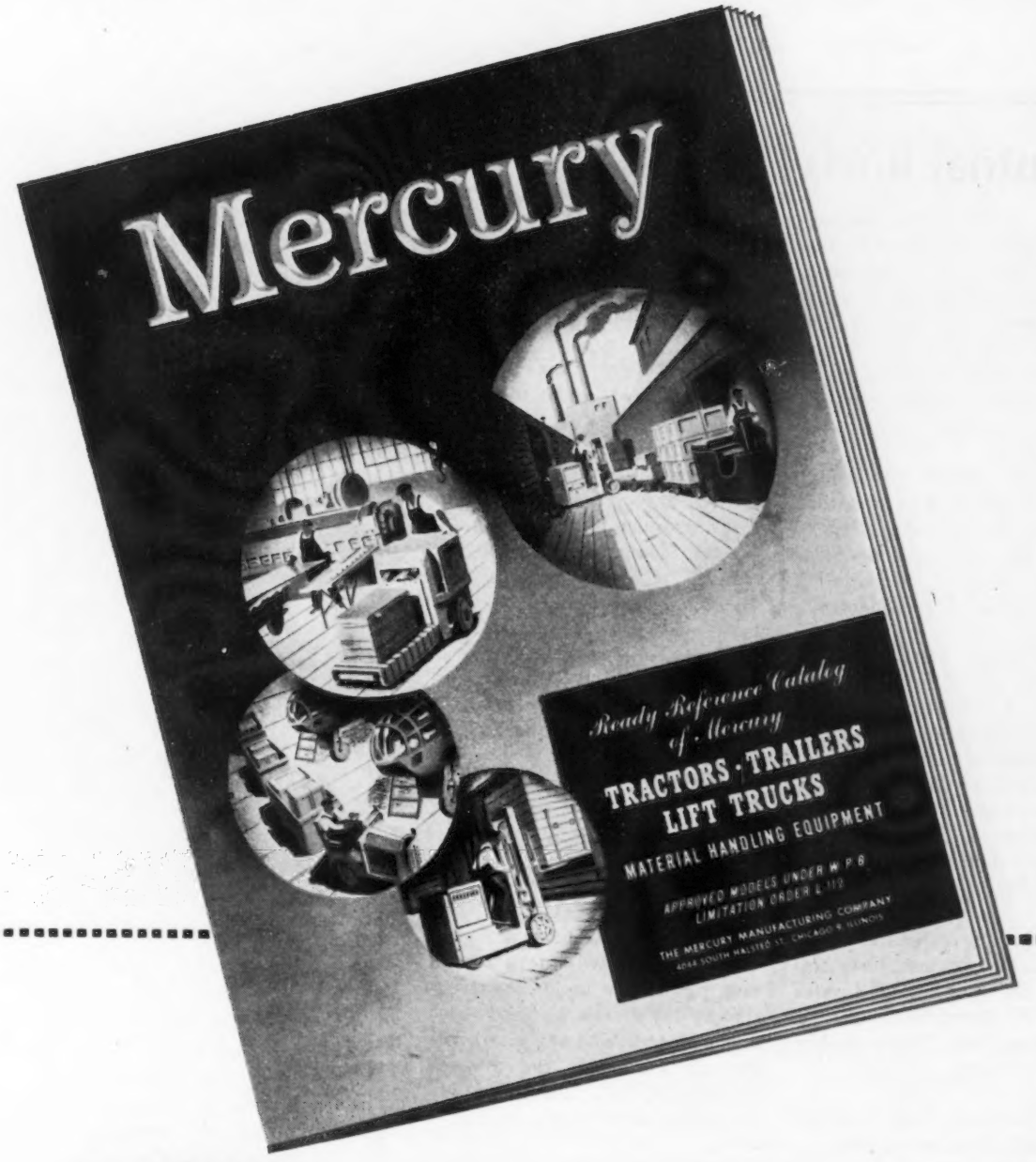
By the end of November, he announced, the total number of employees in the Steel Division will be less than 250, including 28 "dollar-a-year" men. This compares with a peak employment in the Steel Division of about 800 persons.

Information Service to Continue After War Ends

Detroit

• • • **The Tooling Information Service** of the Automotive Council for War Production will be continued through the reconversion period, to assure maximum speed in the obtaining of tools, dies, jigs, gages and other equipment needed in passenger car production.

Approximately 200 concerns list available tooling capacity weekly in the Tooling Information Service, and the publication is distributed to several thousand equipment purchasers. In the postwar period these same buyers will receive the weekly bulletins.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TRACTORS • TRAILERS THE TRACKLESS TRAIN **MERCURY** **AND LIFT TRUCKS**

Industrial Briefs . . .

• BEST PAPER—Three members of the staff of the American Brake Shoe Co.'s metallurgical laboratory at Mehwah, N. J., received the Henry Marion Howe Medal of the American Society for Metals for the best paper to appear in the society's publication, *Transactions*.

• RECEIVES AWARD — General Motors Institute was presented with the Distinguished Service Award and a commendation from the office of the chief of ordnance, War Department.

• NEW MEAD PLANT — Mead Specialties Co., Chicago, manufacturer of industrial burring machines, air clamps and air operated devices, has under construction a new plant at 4114-24 N. Knox Ave. The plant will have 23,000 sq. ft. of floor space, and is located on 60,000 sq. ft. of land.

• NEW OFFICE — Cutler-Hammer, Inc., Milwaukee, have announced the opening of a sales office at 108 North Main Street, South Bend, Ind. Terry Fisher will be in charge.

• NEW MACHINE FIRM — Automatics, Inc., is a new machinery and tool firm organized at Milwaukee by Arthur Nelson, Cyril Zvonar and Stephen Rigler with temporary offices at 410 Caswell Building, Milwaukee.

• ENGINEERS ORGANIZE — The Service Tool & Engineering Co., 1412 Wisconsin National Bank Building, Milwaukee, has been organized by Ben E. Kosmatka and A. Szymanski.

• BUYS FIRM — Wisconsin Marine Construction Co., Prairie du Chien, Wis., has purchased the Northern Engraving & Mfg. Co., LaCrosse, Wis.

• STEEL FIRM—A new steel jobbing firm has entered the Portland market. President of the newly organized company, the American Steel Warehouse, Inc., is Hugh E. Hedinger, general manager of the American Sheet Metal Works, Inc. The company has already let contracts for erection of a quarter-million dollar warehouse.

• WORLD-WIDE MARKET—Birdseye Reflector Lamps for industrial lighting and Infra-Red Lamps for various applications, sales on which were heretofore limited to North American countries, are now made available to the world market. Wabash Appliance Overseas Operations, New York, are in full charge of sales and distribution of these products for export.

• EQUIPMENT INSTALLATION — Acquisition of the facilities of Pohn Iron & Metal Co., Chicago scrap dealers, by Hoyne Iron & Steel Co., has been followed by extensive new equipment installations.

• DIFFERENT LOCATION — Universal Wheel & Abrasive Corp., Chicago, soon will move into a new plant now under construction at 400 North Ashland Avenue, Chicago. The new plant will provide for triple the present production, and will allow for further expansion as required.

• PURCHASED BUILDING—Instrument Parts Corp., New York, has purchased a three-story factory building at Ossining, N. Y., for postwar expansion.

• NATIONAL OFFICE—American Society of Tool Engineers will establish its national office in the Penobscot Building, Detroit. It now numbers more than 16,000 tool engineers in its membership.

• BUYS COMPANY — U. S. Slicing Machine Co., LaPorte, Ind., has purchased Standard Computing Scale Co., Detroit.

• ACQUISITION—Properties and uncompleted contracts of the Steel Forming Corp. were acquired by Harry Glascock, president and treasurer, Dynamic Air Engineering, Inc., Los Angeles.

Cited for Awards

• • • **The following companies** have received the Army-Navy "E" for outstanding war production:

Askania Regulator Co., Chicago. (second star)
DeVilbiss Co., Toledo. (second star)
Hoover Ball & Bearing Co., Ann Arbor, Mich.
Leeds & Northrup Co., Philadelphia. (fourth star)
Metals Refining Co. Division of Glidden Co., Hammond, Ind. (first star)
Vita-Var Corp., Newark, N. J.
Westinghouse Lamp Division's four plants at Bloomfield, Belleville, Trenton, N. J., and Fairmont, W. Va.
Aerial Cutlery Mfg. Co., Marinette, Wis.
American Sanitary Mfg. Co., Abingdon, Ill.
American Type Founders, Inc., Main Plant and A.M.D. Division, Elizabeth, N. J.
Atlas Powder Co., Zapon Division, North Chicago Plant, North Chicago, Ill.
Chicago Electric Mfg. Co., Chicago.
Crystal Research Laboratories, Inc., Hartford.
Dean Milk Co., Pecatonica Plant, Pecatonica, Ill.
Dover Stamping & Mfg. Co., Cambridge, Mass.
Fonda Gage Co., Stamford, Conn.
General Aniline & Film Corp., General Aniline Works Division, Building 81, Rensselaer Plant, Rensselaer, N. Y.
Goodyear Tire & Rubber Co. of Alabama, Gadsden, Ala.
Jones & Laughlin Steel Corp., McKeesport Plant, McKeesport, Pa.
Kittinger Co., Inc., Buffalo.
Maytag Co., Newton, Iowa.
Northwest Airlines, Inc., Northwest-St. Paul Modification Center, St. Paul.
Pfister & Vogel Tanning Co., Milwaukee.
Premium Cap Co., St. Louis.
W. M. Ritter Lumber Co., McClure Plant, McClure, Va.
Sharon Steel Corp., Lowellville Works, Lowellville, Ohio, and Sharon Works, Sharon, Pa.
Simplex Paper Co., Adrian, Mich.
Sun Rubber Co., Barberton, Ohio.
Union Electric Steel Corp., Carnegie, Pa.
Upjohn Co., Kalamazoo, Mich.
A. Wimpfheimer & Brothers, Inc., American Velvet Co., Inc., Stonington, Conn.

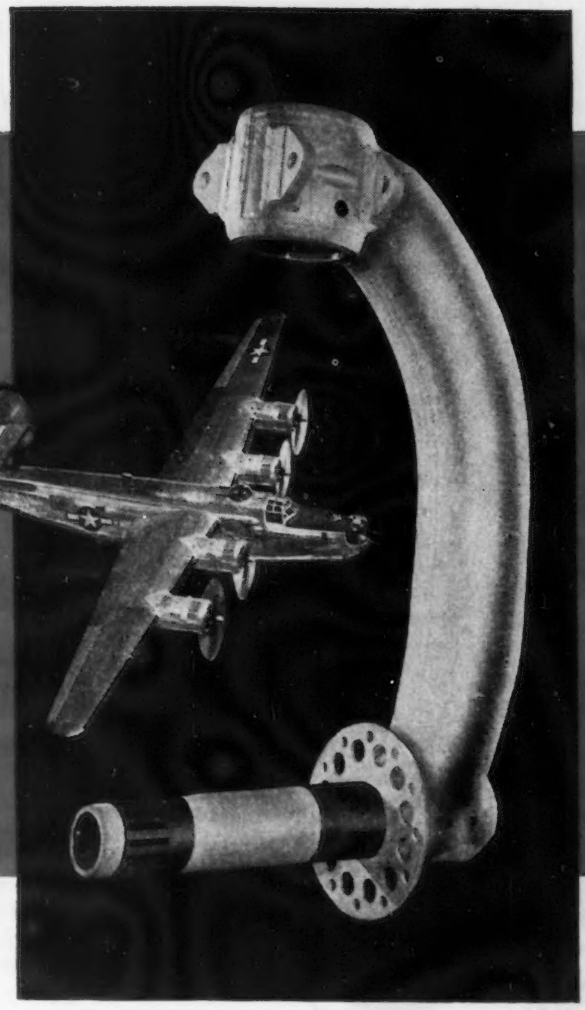
Graham to Double Alligator Output

Detroit

• • • **Production of versatile** "alligators," the amphibian tank which has proved itself in the Pacific and is now playing an important role in the invasion of the Philippines, will be doubled at Graham-Paige Motors Corp. within the next 30 days, it was announced here recently by Raymond J. Hodgson, president.

In announcing the company's largest contract of the war, the Graham executive said that plant facilities have been expanded and that work on new assembly lines is nearing completion.

He disclosed that the present contract for LVT-4 type amphibian tanks will be completed by the middle of November and that the new Navy order will be for a model which has never before been in action.



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IMMEDIATE MASS PRODUCTION THROUGH SMITHway!

SMITHway Electrodes in Action — *Formerly, the Liberator Landing gear fork was made of forgings and a tube, bolted together. NOW, SMITHway Electrodes weld simple stampings into a one-piece unit, 15% stronger, 18% less raw material, adapted to speedy, economical mass production.*

"OVERNIGHT" came the demand of America's Air Forces for Liberator bombers, by the thousands! They were vital to victory . . . the "impossible" had to be done . . . equipment wasn't available . . . mass production couldn't be organized along usual lines.

Modern SMITHway Certified Electrodes and welding technique were applied . . . simple stampings, SMITHway welded, now make better landing-gear forks, *faster* . . . and mass production has again been accomplished "overnight"...the SMITHway!

The proof of the value of SMITHway Electrodes is in many of the biggest, toughest welding jobs on record. More than 320,000 of these electrodes go into successful welds daily in SMITH production.

You, too, can now use these quality-proved electrodes. Warehouse stocks in principal production areas.

Phone, wire, or write nearest office.

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made by welders . . . for welders

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SMITHway A. C. Welding Machine saves power; eliminates arc blow.

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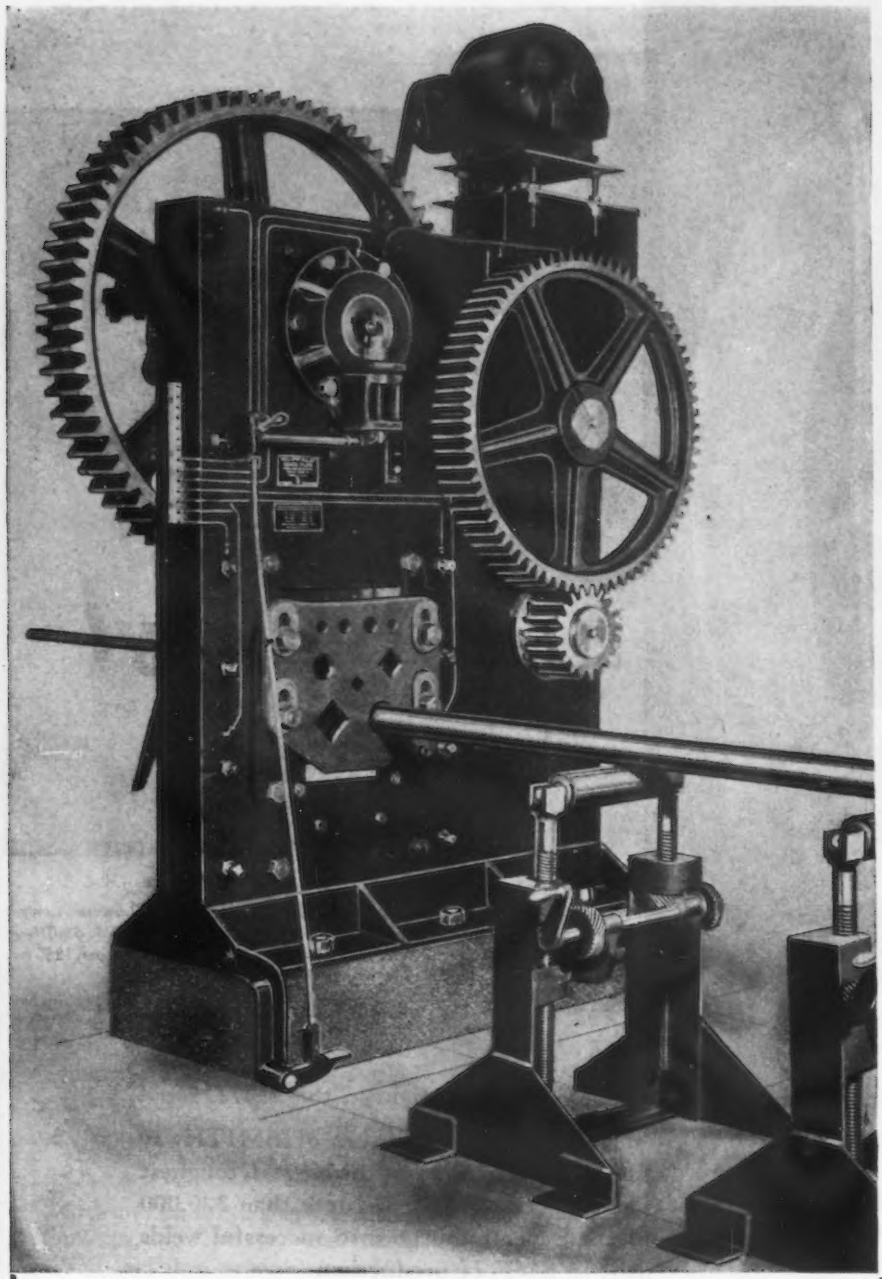

This "Buffalo" Bar Cutter

cuts a variety of sizes and shapes without frequent knife changes. Both frame and plunger knives are changed from front of machine, and simple knife adjustment is made from front also. Centralized oiling system assures necessary lubrication of working parts. Note roller supports for use with long stock; these are designed for quick elevation to bring stocks to level of various knife openings and are easily moved out of the way when not in use.

For warehouse, merchant mill, or industrial plant, Buffalo Bar Cutters offer low-cost accurate metal cutting. The complete line including Buffalo Billet Shears is described fully in Bulletin No. 3295. Write for copy.

BUFFALO FORGE COMPANY
492 BROADWAY BUFFALO, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **Bar Cutters Billet Shears**

First Metal Hulled Man-of-War Relic Of 100 Years on Lakes

Pittsburgh

• • • **Among anniversaries** being quietly observed in the United States during this war year is the centennial of the first metal-hulled man-of-war in any navy, the U. S. S. Wolverine (ex-Michigan).

In mid-1842 the firm of Stackhouse and Tomlinson, of Pittsburgh, was awarded a contract for furnishing the material and building the boilers, engines and hull of this new type of warship, designed and intended for service on the Great Lakes. Although wrought iron had been known principally for its ability to withstand corrosion, the use of metal for the hull of a ship was a radical departure in naval practice. There were many who predicted that "an iron ship would sink."

There being no railroad between the two cities, all parts of the vessel were fabricated in Pittsburgh and shipped part way to Erie by barge through the old Beaver Canal. The remainder of the journey was by ox-cart.

At the scheduled launching, the vessel traveled a short distance down the ways and stuck. Efforts to free her were fruitless and were abandoned with the coming of night. The fears of many that an "iron ship" was doomed to failure, seemed to be coming true.

The next morning, however, workmen were surprised to find that the ship had freed herself and was afloat, upright and dry—a vessel that had launched herself.

Designed as an iron paddler of 580 tons, the vessel was actually registered as an unarmored, unprotected cruiser at 498 gross tons, 164 ft. long at waterline, 178 ft. long overall, 27 ft. beam, and 10 ft. draft at full load. In these dimensions she is somewhat similar to the Navy's present-day 180-ft. patrol craft. Old records give a full-load displacement of 685 tons.

In 1844 the Michigan began her career on the Great Lakes, her first assignment being to break up an illegal Mormon settlement on Lake Michigan. This was followed by a series of lake patrols and, during the Civil War, by guard duty off a Confederate prisoners of war camp on Johnson's Island. In 1866, in conjunction with the Canadian militia, she

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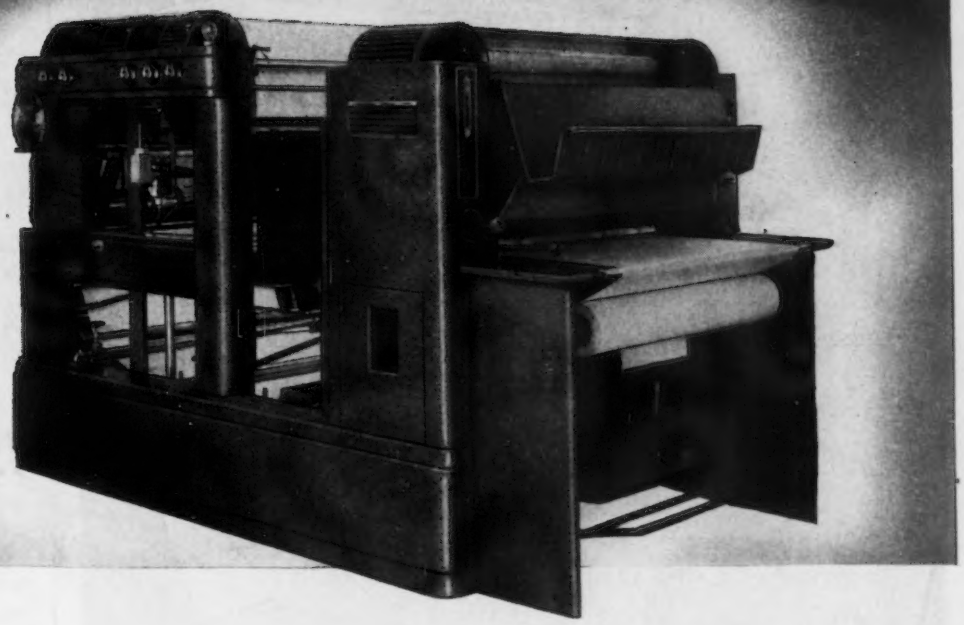

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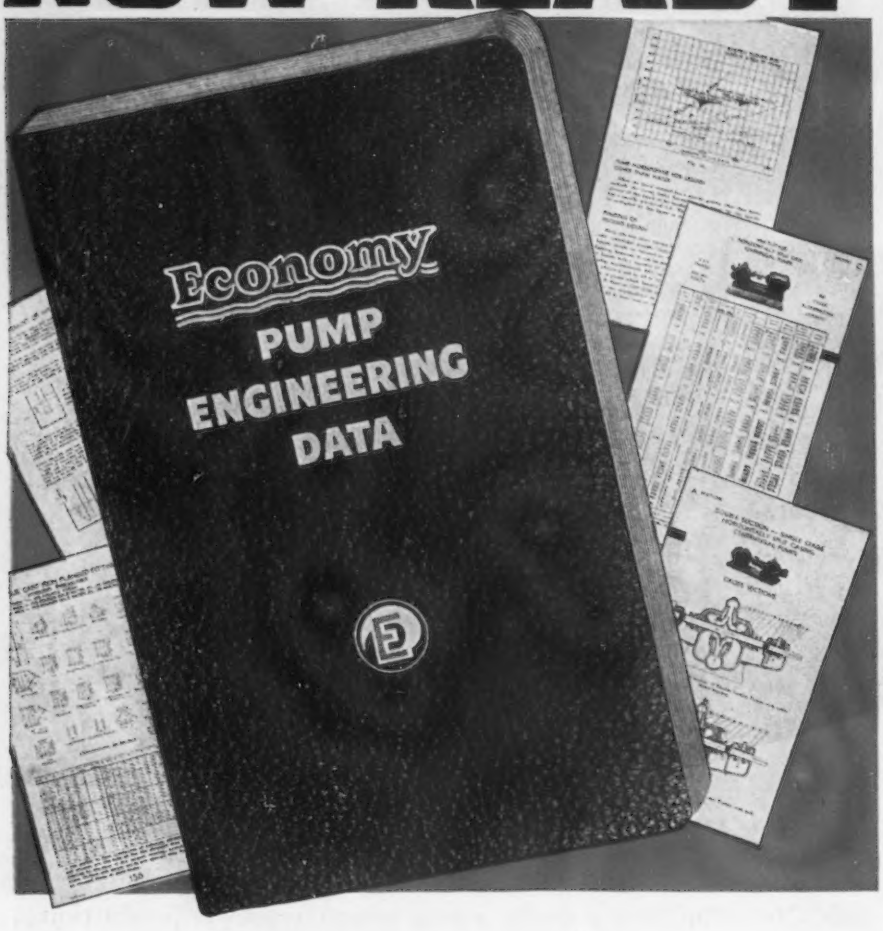

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FOR OVER THIRTY YEARS MAKING BETTER PUMPS DO MORE

aided in suppressing the Fenian Invasion of Canada near Buffalo.

Both the Spanish-American War and World War I found her used as a training ship for new recruits. She also was used at various times as a survey ship, flagship to the naval militia and even as a rum-patrol vessel.

It was in June, 1905, that the ship's name was changed from Michigan to Wolverine, the name Michigan being assigned to the original battleship Michigan, then building.

During a postwar economy wave, the vessel was de-commissioned in 1926. In July, 1927, she was loaned to the City of Erie, Pa., as a relic. Later she was moved to Presque Isle.

Atomic Explosives Still Another New Secret Possibility

Washington

• • • **Atomic bombs,** one of the least discussed weapons in the possible secret weapon field, are receiving serious study and research both here and in Germany, according to a statement made by a high Army Air Forces officer in a press conference recently.

The statement followed closely the announcement that orders have been placed for numbers of copies of the German model robot bombs. The officer stated that although he did not think the Germans would develop a decisive secret weapon, considerable work is being done on atomic explosives. To a question on a Swedish report describing German atomic work, the officer stated:

"Nearly anything is in the realm of possibility, and I am not enough of a physicist to know exactly where we stand in working on an atomic explosive force, but I believe there are many technical difficulties to overcome. No doubt the Germans are working hard at overcoming those difficulties, even as we are."

Members of Congress have also hinted recently that we are developing atomic explosive techniques in West Coast plants, but this semi-official announcement was the first specific reference by War Department officials.

The subject of the available power resulting from the disintegration of atoms has long been the source of study among scientists everywhere, and it is assumed that development of an explosive force utilizing this force will harness the power of this disintegration.

FROM METAL CLEANING TO ASSEMBLY
Sooner
THE BULLARD-DUNN STATION TYPE CONVEYOR
• Lifts heavy weights to convenient heights (3000 lbs. up to 40 inches for the smaller size; 9000 lbs. up to 66 inches for the larger size).
• Is built by Bullard, to Bullard's machine tool standards.

WITH THIS BULLARD-DUNN AUTOMATIC STATION-TYPE CONVEYOR

This machine is conveying heat treated tractor parts through the Bullard-Dunn Descaling Process, but it is equally valuable for other sequences too;—for example, plating, blackening, pickling, bonderizing, cleaning aluminum prior to welding, and heat treating.

This machine expedites production like other conveyors, but as a machine it is different. It is built like a machine tool by a machine tool company. It is rugged and can carry heavy, unbalanced loads through high lifts. The Geneva type of index motion produces smooth indexing.

The machine is compact, the oil for the hydraulic operation being within the column itself, and the pump and motors being mounted on the column. The simplicity of the machine and few parts involved make for uninterrupted service.

Write for the booklet giving specifications and other information.

BULLARD-DUNN Conveyor

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When Post-War Plans Call For
SCREW MACHINE PRODUCTS . . .

. . . Take it to Federal Screw

Here are two typical jobs produced at Federal Screw Works—an indication of the service available to you for the post-war manufacture of screw machine products of all types and sizes.

Aircraft Engine Cap: 1 1/4" hex SAE 6150 chrome-vanadium steel. External and large internal threads milled; small internal thread tapped —all Class 3 fit. All threads burred and all surfaces polished.

Aircraft Engine Rocker Arm Shaft: 11/16" round SAE 6150 bar stock, heat treated to 26-31 Rockwell C. Small diameters turned, thread rolled (Class 3 fit) and holes index-drilled at 90°. Diameters ground and polished to .0004" tolerance.

In addition to numerous batteries of modern automatics, the manufacturing facilities of our several large plants include milling, broaching, grinding, heat treating and electroplating departments. Cold-heading and thread-rolling departments are also at your service, as well as special secondary-operation equipment—*complete* production facilities unexcelled in the screw machine industry.

Navy "E" Burgee
Awarded Jan. 31, '42

Army-Navy "E"
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4 Stars Have Since
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Army-Navy "E" Flag

This variety and quantity of up-to-the-minute equipment, operated by skilled personnel and backed by long experience on widely-varied work, may well make Federal Screw Works the logical source of supply for many of your peacetime needs. Let's talk it over *now*; no obligation of course.

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Shipyard Workmen Contribute Ideas Worth 25 Million

Washington

• • • **In less than** two years, more than $25,000,000 has been saved in manhours and material in building ships as the result of ideas and suggestions submitted by shipyard employees, according to the United States Maritime Commission. From the launching of its speed-up suggestion program, Aug. 11, 1942, to the end of the last fiscal year 2400 suggestions were reviewed by the commission's shipyard efficiency awards committee and 90 per cent were found to be meritorious enough for distribution to all shipyards.

All this has been accomplished at a cost of $106,104 for cash and War Bond awards ranging from $25 to $100 given employees for successful suggestions, plus the expense of providing devices required to carry some of the suggestions into practice. In addition to the money savings realized, the commission said, there have been many safety suggestions made and some on health promotion whose value cannot be measured in dollars. In addition, these suggestions improved morale and the quality of work.

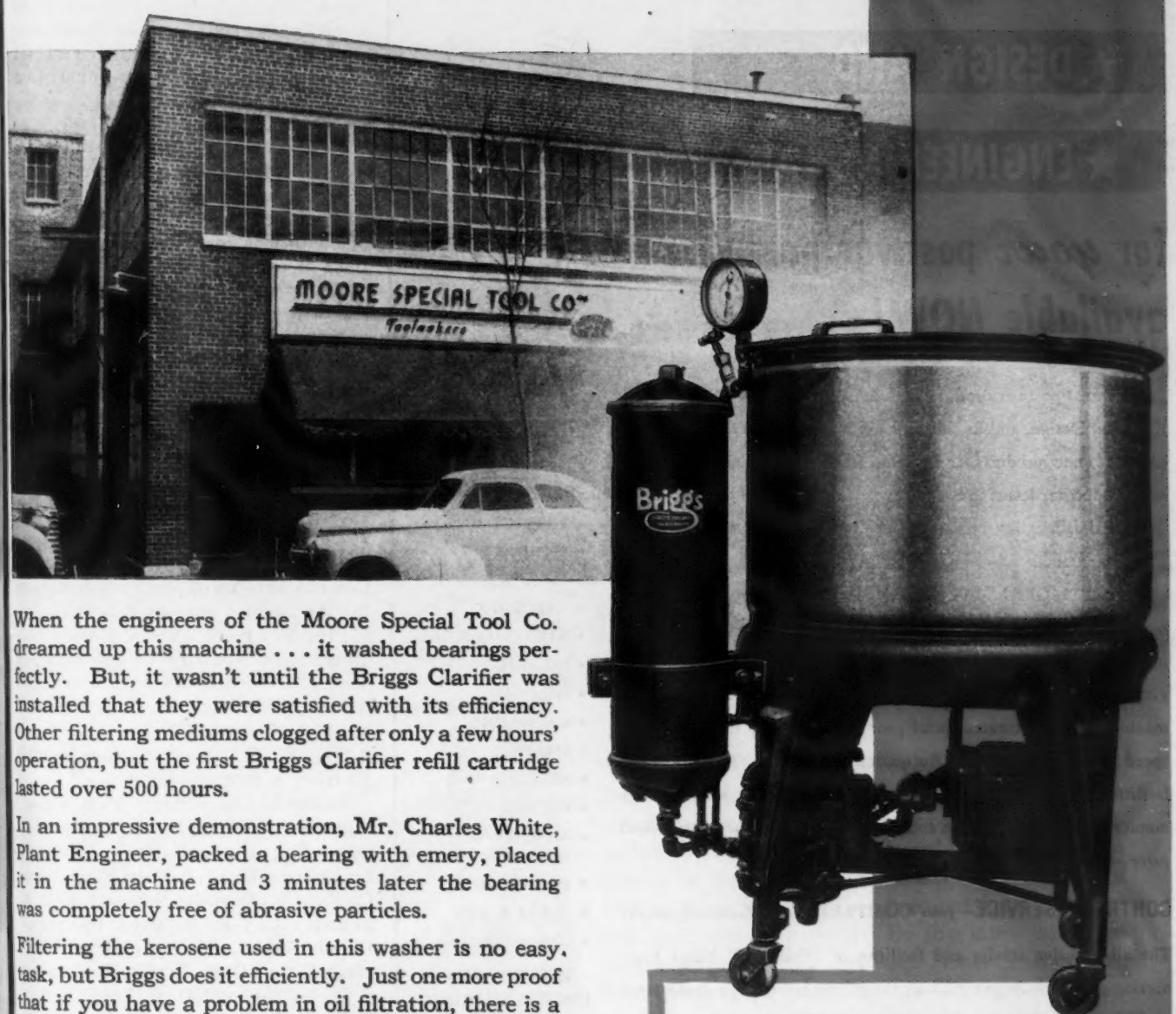
The shipyard in which the largest saving in manhours and material has been effected as the result of employee suggestions is the Permanente Metals Corporation yard No. 2, Richmond, Cal. The hours saved total 6,495,993, which, with the economy in materials achieved, caused a reduction of $8,874,308 in costs. The awards to employees totaled $6325.

The St. Johns River Shipbuilding Corp., Jacksonville, Fla., ranked second with a saving of $2,927,496. The California Shipbuilding Corp. yard at Wilmington stands third with a saving of $2,177,174.

Many of the winning suggestions show marked ingenuity and have substantially contributed to the speed with which ships of the Victory Fleet have been built during the last two years, the commission said. Typical winners recently include: An electrical device for locating accidental grounds on electric lines or equipment supplied by 440-volt current, saving 5000 manhours per month; a jig to facilitate the drilling of holes for installation of portholes, saving 1158 manhours per ship; use of a special burning machine and a rivet gun clamp, saving 5750 manhours per

SLIGHTLY UNORTHODOX... *But It Works*

Ingenuity Plus A BRIGGS Oil Clarifier Produced This Efficient Bearing Washing Machine!



When the engineers of the Moore Special Tool Co. dreamed up this machine . . . it washed bearings perfectly. But, it wasn't until the Briggs Clarifier was installed that they were satisfied with its efficiency. Other filtering mediums clogged after only a few hours' operation, but the first Briggs Clarifier refill cartridge lasted over 500 hours.

In an impressive demonstration, Mr. Charles White, Plant Engineer, packed a bearing with emery, placed it in the machine and 3 minutes later the bearing was completely free of abrasive particles.

Filtering the kerosene used in this washer is no easy task, but Briggs does it efficiently. Just one more proof that if you have a problem in oil filtration, there is a Briggs Oil Clarifier that will meet your requirements.

See the Briggs distributor in your locality for information on Briggs Oil Clarifiers for filtering lube oils, hydraulic oils, cutting oils and coolants.

Just a domestic washing machine with a Briggs G-800 Oil Clarifier installed in the pressure line of a rotary gear pump . . . yet it proved a life-saver for the Moore Special Tool Co. of Bridgeport, Conn. Bearings that formerly were returned to the factory for cleaning are washed in this machine with kerosene and Moore production rolls merrily along.

Briggs

PIONEERS IN MODERN OIL FILTRATION

BRIGGS CLARIFIER COMPANY

GENERAL OFFICES, WASHINGTON 7, D. C.

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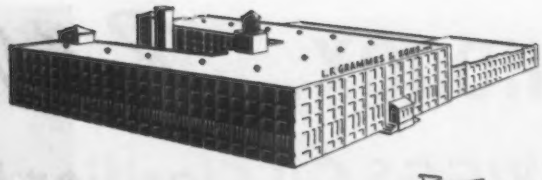

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For eventual postwar production, GRAMMES Contract Service offers Research, Design, and Engineering aid NOW for the development of ideas into new products, and product improvement. Newly perfected war production techniques and increased plant facilities supplement our metal fabricating resources, enabling us to accommodate a few sizable accounts.

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The all-inclusive service and facilities of "Packaged" Metal Engineering provide—*in one package . . . in one service, the assumption of* ALL *responsibility . . . functioning as* YOUR *factory from Design Research to Drop Shipments.* Let our sales-minded executives work with you, complete confidence assured.

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ESTABLISHED 1875

NEW YORK CHICAGO DETROIT CLEVELAND MILWAUKEE PHILADELPHIA

month in installation of gunwhale bars; attachment for stud welding guns that tack welds cable hangers, eliminating two of three men from every crew needed, saving 1200 man-hours per ship.

Among recent winning safety suggestions are a safety latch for large tackle blocks to prevent load from slipping off hook and an automatic switch to give intermittent horn blast warnings when trucks are operating in reverse.

In addition to the cash and War Bond award the Maritime Commission is distributing official certificates of merit to ship workers for suggestions increasing ship production and also citations for outstanding suggestions of exceptional merit.

Thirty-six shipyards in all parts of the United States are now participating in this speed-up suggestion competition.

Acid Open Hearth Research Association Names Organization

Pittsburgh

• • • **The Acid Open Hearth Association** has announced their organization for the current year as follows:

President F. H. Allison, United Engineering & Foundry Co.; vice-president, J. L. Nichols, American Locomotive Co.; secretary, F. C. T. Daniels, Mackintosh-Hemphill Co., and treasurer, R. C. Heaslett, Continental Foundry & Machine Co.

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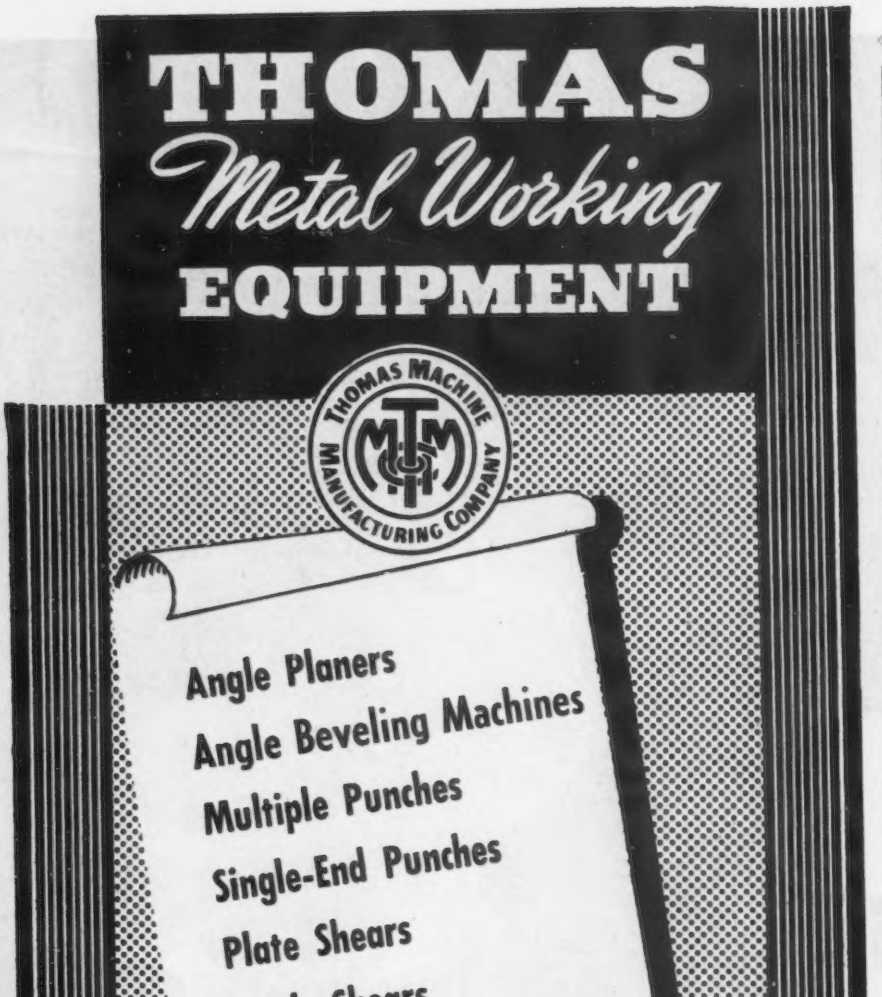

Government-Business Cooperation Urged For Postwar Housing Job

New York

• • • **Government and private** enterprise will have to work together to do the job of providing the millions of houses that America will need in the years following the war, according to Thomas R. Carskadon's 32-page pamphlet, *Houses for Tomorrow*, published by the Public Affairs Committee, Inc., here.

The great bulk of the houses will come from private industry, according to Mr. Carskadon, but public housing will have to fill the gap caused by the inability of private enterprise to provide adequate housing at prices low enough to reach the lowest income groups of the population.

This means a continuation of the kind of help made available through the U. S. Housing Authority and carried on today by the Federal Public Housing Authority. While some real estate and other groups have opposed this approach, the pamphlet points out that in actual practice private housing interests and government agencies often have worked well together.

The pamphlet, based on a recent study made by the Twentieth Century Fund's Housing Committee, emphasizes that Committee's recommendations that "public activity be designed so far as possible to the end of reduced costs and more efficient forms of industrial operation."

It urges that the division of the total effort between public and private activity be determined, not on doctrinaire grounds, but on the basis of the most practicable means of doing the job, and that measures for direct aid to housing be closely coordinated with, and as far as possible act as a stimulant to, the efforts of private enterprise.

In addition to surveying the role of public housing, the pamphlet covers such matters as the amount of building that will need to be done after the war, the number of jobs that will be created, and the changes that must be made in the housebuilding industry, in trade union practices, and in selling and financing methods if our housing needs are to be met. Mr. Carskadon concludes that these needs can only be met by "abandoning the great and heavy tradition of housing as a localized, feeble enterprise with a limited market."

The inspector is seated comfortably before the fluoroscopic window of the Picker Ray-Proof Combination X-Ray Inspection Unit. The Unit requires no manual unloading, since ejection of defective parts is automatic.

fluoroscopy or radiography?

The many benefits of x-ray inspection of parts *before* machining have been amply demonstrated in hundreds of case histories where lower costs and higher quality are the end results. The question then resolves itself in one of *method*. Within its limitations, x-ray fluoroscopy is the ideal answer in some cases; radiography is indicated in others. The determining factors are density and section thickness of the material to be examined.

This Picker Combination Conveyor Production Inspection Unit is designed to perform both fluoroscopy and radiography with equal facility. This single Combination Unit obviates the previous need for a separate apparatus for either function.

A Picker engineer will be glad to survey your own inspection problems and recommend a practical procedure, based on your individual requirements. The Picker line of industrial x-ray inspection units embraces types designed not only for large quantity production inspection requirements, but also for small-scale examination where major investment is neither necessary or desirable.

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(This coupon can only cover the highlights of your inspection problem. If you wish to describe it more fully in a letter, it will help us in preparing a recommendation.)

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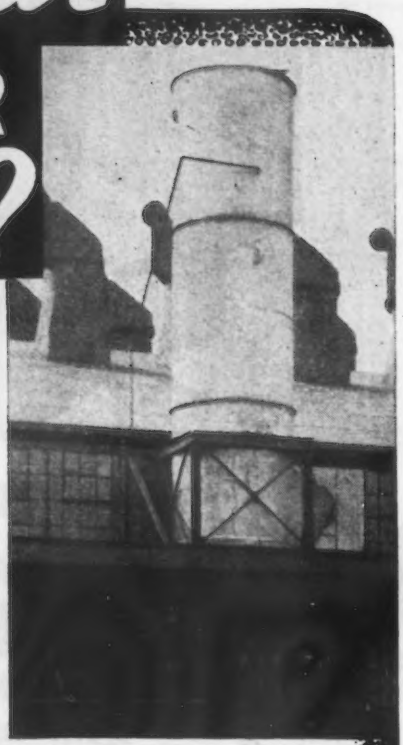

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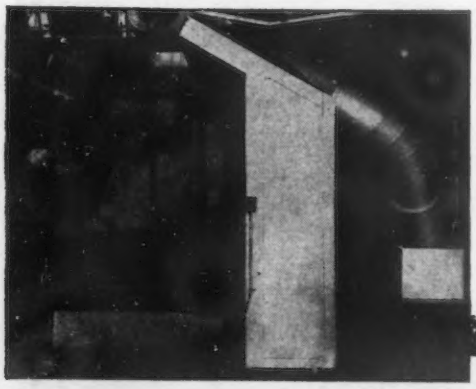

The dust and fume curse is lifted from shake-outs by Schneible "Uni-Flo" Hoods, with minimum air volume.

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Labor Dispute Cases And Workers Involved Decline in September

Washington

• • • According to the U. S. Department of Labor its Conciliation Service disposed of 2290 cases involving 937,758 workers during September. This compares with 2487 cases and 1,262,562 workers in August and 2188 cases involving 1,449,193 workers in July.

Included in the above totals were 292 cases involving the iron and steel industry in September, 314 in August and 263 in July. The number of workers involved in these iron and steel cases were as follows: In September 86,350, in August 72,484 and in July 86,387.

In a breakdown showing the type of situation which was disposed of in the cases involving the iron and steel industry, the Service reported the following: Strikes—September accounted for 56 cases involving 14,049 employees; August, 64 strikes involving 17,025 workers, and July 52 strikes involving 23,669 employees. Threatened strikes — September, 22 cases involving 5838 employees; August, 15 cases involving 1833 employees, and July, 23 cases involving 5106 workers. Controversies — September, 128 involving 40,772 workers; August, 146 involving 50,790 workers, and July, 170 involving 57,139 workers.

Details on other situations which the Service handled were as follows: Arbitration—September, 13 cases involving 674 workers; August, 18 cases involving 1780 workers, and July, 8 cases involving 209 employees. Other miscellaneous classifications included technical and special services involving a small number of cases and employees.

In September it was necessary for the Conciliation Service to certify to the National War Labor Board 60 iron and steel cases involving 24,517 workers, compared with 53 cases and 13,134 employees in August and 62 cases covering 28,504 employees.

In the three months covered by the above statistics, the iron and steel cases indicated no substantial change in the number of workers involved. This trend was contrary to the experience for the total cases covered by the Service. The figures disclose, however, that while 55 strike cases were processed by the Service in the iron and steel industry for Septem-

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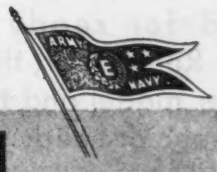

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ber as against 52 in July, the number of employees involved in the September strikes were 14,049, compared with 23,669 in July. With manhours lost in strikes not given, the severity of these disputes cannot be obtained from the number of workers involved. However, a general trend is indicated.

Spot Authorizations For Civilian Goods Seem on the Increase

New York

• • • **Spot authorizations** have been approved by various regional War Production Boards, giving local manufacturers permission to resume production of specific civilian products where no interference with the war effort will result.

The New York City companies are as follows:

Mesco Mfg. & Sales Co., Inc., antimony lead picture frames; Atlantic Service Co., Inc., cutlery grinders; Lulis Co., portable electric lamps; Rest Wel Products, innerspring mattresses; Wolff Appliance Corp., ash trays; Silver Glove Corp., dry cleaning equipment; Safran & Glucksman, Inc., portable electric lamps; Polarized Products Corp., polarized sun glasses; Barney Stempler & Sons, Inc., wire clothes hangers; R. H. Macy & Co., innerspring mattresses; Quaker City Metal Products Corp., metal radiator covers; Charles Beckley, innerspring mattresses; Crown Mattress Co., innerspring mattresses; LaBelle Silver Co., Inc., aluminum hollow ware; Style Metal Specialties Co., metal photo frames; and Jacob Rabinowitz & Co., hooks, eyes, slide and snap fasteners, buckles, buttons and nail heads.

In addition to those cases previously reported, the following spot authorizations have just been approved in the district offices of the New York region as follows:

Albany District; Tug-O-Wheel Plow Co., hand plows and cultivators.

Syracuse District: Co. of Master Craftsman, Inc., innerspring mattresses; Merchants Spring Co., garment hangers.

Utica District: S. Rosen Mfg. Co., clothes line pulleys.

Newark District: Electric Fixture Mfg. Co., skillets.

Buffalo District: Trico Products Corp., vacuum fans; Warner Jewelry Case Co., jewelry boxes and metal top cushions; George A. Ray Mfg.

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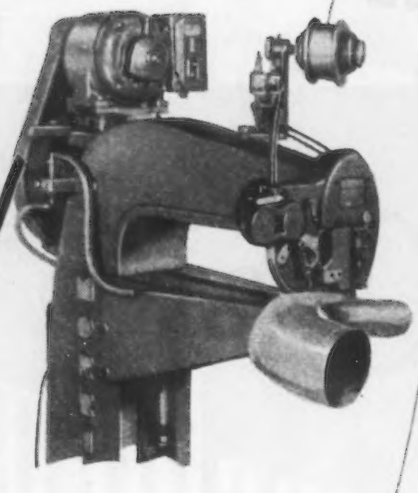
THE STITCH THAT *Saves Time!*



Stitching saves time for many a war-busy manufacturer today...and when the steel thread is ROEBLING ROUND WIRE, it won't jam up in the machines —and waste the hours gained!

Roebling Round Wire can be built to all practical specifications... including tensile strength and finish. And because it's the product of men and machines with *specialized* experience in wire making, you can count on it to dovetail with your product requirements—help you meet your production quotas.

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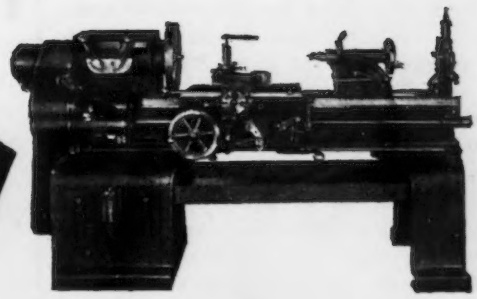
Co., commercial cooking equipment; Sponge Aire Seat Co., Inc., baby seats for autos; Ruslander & Sons, Inc., vegetable and food preparation sinks and diet kitchens sinks, food preparation and serving fixtures; William L. Kirst, fishing tackle; LaSalle Lighting Products, Inc., portable electric wall lamps; Mac-Feld's Mfg. Co., venetian blinds; Victor J. LaPage, trumpet mutes; W. I. Blystons Mattress Co., innerspring mattresses; Kinfolks, Inc., outdoor knives; Dobbie Foundry & Machine Co., cast iron manhole frames and covers; McAdam & Sons, potato diggers, disk harrows and springtooth harrows.

Milwaukee District: Adjustable Fixture Co., 7200 hospital bedside examining lamps; Buran Metal Products Co., 80,000 paper towel dispensers; Hersh Electric Specialty Co., 10,000 electric space heaters; W. E. Cheney Co., 16 electric stairway elevators; Midwest Lamp & Novelty Co., 6000 table lamps, 6000 boudoir lamps, 4000 floor lamps; Midwest Mfg. Co., 200 built-in type electric air heaters and 2300 portable type electric air heaters, plus 1300 10-in. cabinet type exhaust fans; Milwaukee Electric Tool Corp., 2200 pneumatic body and fender hammers; Milwaukee Venetian Blind Co., 1200 steel venetian blinds; National Tinsel Mfg. Co., 50 tons of lead foil icicles, which are used on Christmas trees; Sengbusch Self-Closing Inkstand Co., 60,000 dip type pens; Simmons Co., 20,000 dual sleeping equipment (metal frame lounges), 144,000 metal beds, 44,800 metal cots, 12,000 box springs, 48,560 single deck coil springs, 21,400 deck coil springs, 36,420 crib springs; West Bend Aluminum Co., 4,200,000 household cooking utensils, trays and other kitchenware and household articles; Whirlwind Lawn Mower Corp., 75 power mowers; Wonder-Rest Corp., 18,000 innerspring mattresses.

Pittsburgh District: American Chain & Cable Co., Page Steel and Wire Division, gates for fences; Aluminum Cooking Utensil Co., household and commercial cooking utensils; W. J. Banines, automotive maintenance equipment; Copperweld Steel Co., copperweld wall ties for farm buildings; Pittsburgh Table Co., metal kitchen tables and chairs; J. P. Richtarsic, health exercisers, spring horses; Royal Bedding Co., innerspring mattresses, day beds, box springs; Johnstown National Mattress Co., bed springs and innerspring mattresses; McKee Glass Co., aluminum parts for heat resisting glassware.



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Engineering Dean At Northwestern Elected Washington Award Head

Chicago

• • • **Ovid W. Eshbach**, dean of engineering, Northwestern Technological Institute, Northwestern University, has been elected chairman of the Washington award commission, which annually selects an engineer pre-eminent in advancing human welfare.

The award was proposed in 1916 by John W. Alvord, past president of the Western Society of Engineers, who donated a fund for its maintenance. The scope of the award was later enlarged and the name "Washington Award" adopted as a reminder that the first president of the United States was an engineer.

Nine members of the Western Society of Engineers serve on the award commission with two representatives each of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and American Institute of Electrical Engineers. Current representatives are O. W. Eshbach, George E. Boyd, E. Gordon Fox, F. G. Gordon, Robert B. Harper, F. H. Lane, M. M. Leighton. William V. Kahler and H. C. Townsend, Western Society of Engineers; Langdon Pearse and C. B. Burdick, ASCE; B. E. Sandell and H. M. St. John, AIME; William S. Monroe and H. S. Philbrick, ASME; H. B. Gear and L. R. Mapes, AIEE.

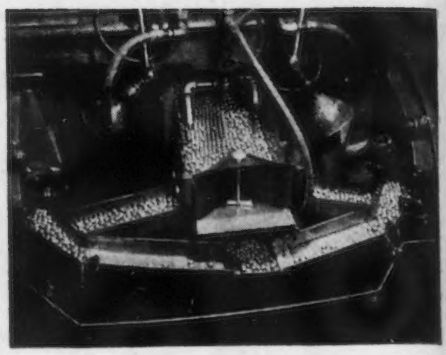
Metal Treating Group Elects New Officials

New York

• • • **The Metal Treating** Institute re-elected Horace C. Knerr, Metlab Co., Philadelphia, president at its 12th annual meeting in Cleveland on Oct. 15. L. A. Lindberg, Lindberg Steel Treating Co., Chicago, was elected vice-president. These two officers, together wtih the following, constitute the new Board of Trustees:

To serve for two years—Si Edwards, Industrial Steel Treating Co., Oakland, Calif.; Charles G. Heilman, Commonwealth Ind., Inc., Detroit.

To serve for one year—Joseph H. Bockrath, Wiedemann Machine Co., Philadelphia; Walter G. Hamilton, Accurate Steel Treating Co., Chicago; George H. Porter, III, The Geo. H. Porter Steel Treating Co., Cleveland; Charles I. Wesley, Wesley Steel Treating Co., Milwaukee.



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Personification—here is a typical representation of American versatility.

In a small but important way, all the employees here had a personal interest in the success of General Eisenhower's attack.

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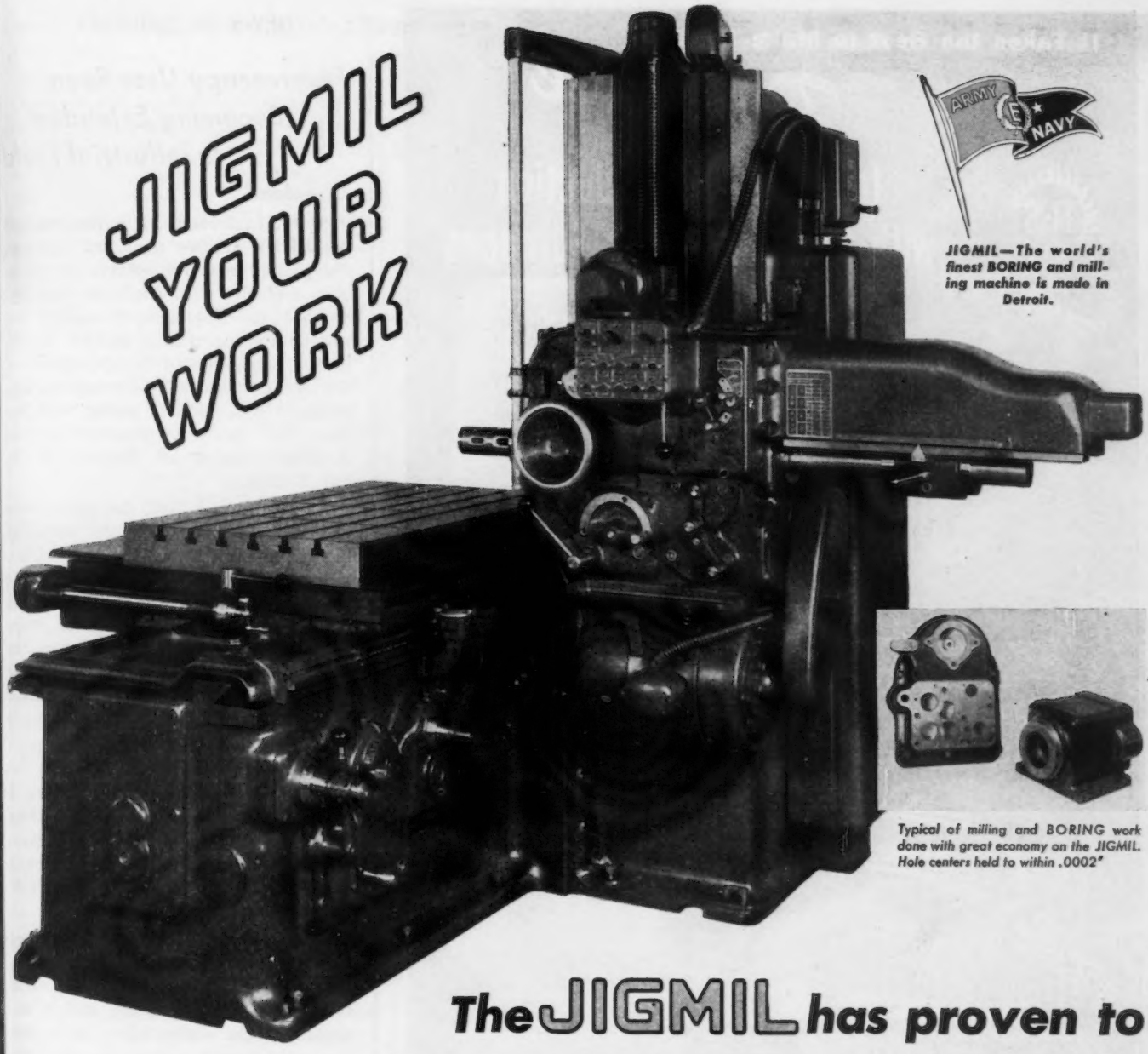

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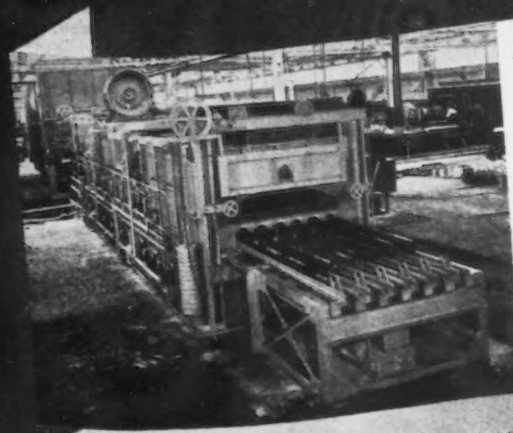
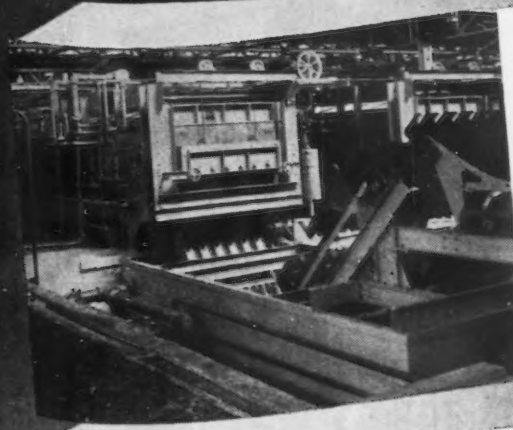
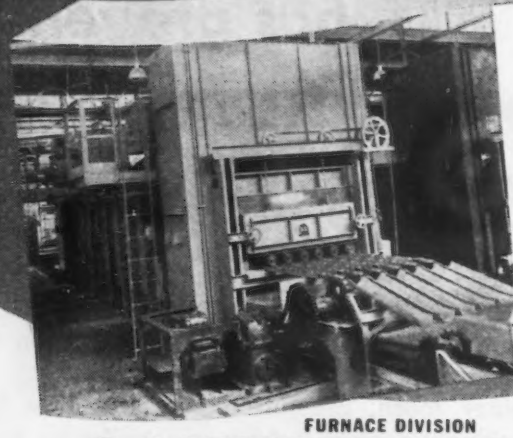


Unexcelled engineering ability in the production of heat-treated heavy artillery shells is exemplified by this automatic, gas-fired R-S installation. The shells are pushed through the hardening furnaces in six parallel conveying tubes.



Shells are quenched internally and externally, then leave the quench tanks on continuous conveyors.



The draw furnaces, through which the shells move on alloy chains. The result is uniform heat-treatment and low cost production.

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Fluoroscopy Uses Seen Becoming Extended In Industrial Field

Cleveland

• • • **Acquirement of a fluoroscopic sensitivity** of five per cent through the patient research efforts of physicists and electrical engineers has developed the fluoroscope's utility for practical inspection of metals, R. W. Mayer, manager of industrial sales, Kelley-Koett Mfg. Co., Covington, Ky., declared Oct. 18 in a paper read before the national meeting of the American Industrial Radium & X-ray Society.

As recently as 1942, the fluoroscope had been of little practical value in heavy industry, Mayer disclosed, since it was just not possible at that time to attain a sensitivity better than 10 per cent which prevent the fluoroscope from coming into general use in the inspection of metals. It could only be used for the detection of gross flaws.

"It was thought that if that limit could only be cut in half and a fluoroscopic sensitivity of 5 per cent acquired, there would be available a practical tool that could be used alone for many applications and in combination with radiography for many others," Mayer revealed. This has now been accomplished.

Although the fluoroscope provides no permanent record, Mayer cited the possibility of fluoroscope observation attaining a craftsmanship rating approaching the status of a profession that will greatly reduce the need for permanent records.

Since the operator of a fluoroscopic testing unit is responsible for detecting small flaws under a serious physical strain, the prime requisite for a fluoroscope observer, Mayer pointed out, is good vision. It is usually considered that the best observers should be between 20 to 25 years old, either male or female. He suggested that the U. S. Army Air Force vision test or the British RAF night flyers' vision test might serve, at least, as a starting point on which fluoroscope standards might be based as qualifying an observer.

Stressing the importance of recognizing the serious physical strain under which the observer functions, Mayer recommended that operators' shifts should be of short duration, not more than 30 min. at a stretch.

Mayer indicated that by and large the fluoroscope should be considered as a supplement to radiography rather

than a substitute. He suggested combining fluoroscopy with radiography so as to take advantage of fluoroscopic economies as much as possible by allocating the work according to the strictness of the inspection required and use of fluoroscope on all jobs where 5 per cent will pass and using it as much as possible on the 100 per cent inspection jobs.

With a continuous conveyor cabinet the work goes through so quickly that almost any job can be inspected 100 per cent at very small additional cost, he said, and declared that this low cost of inspection also opens new fields for the X-ray department because incoming material can be given a 10 per cent inspection on the fluoroscope, thus affording a check on the quality of materials being supplied by vendors.

Adverting to the future of the fluoroscope in industrial applications, Mayer said its use will accompany an increased emphasis on cost reduction by maintaining materials up to standards required. There is still plenty of room for further development, he concluded.

Pittsburgh Steel Sets Up Veteran Program

Pittsburgh

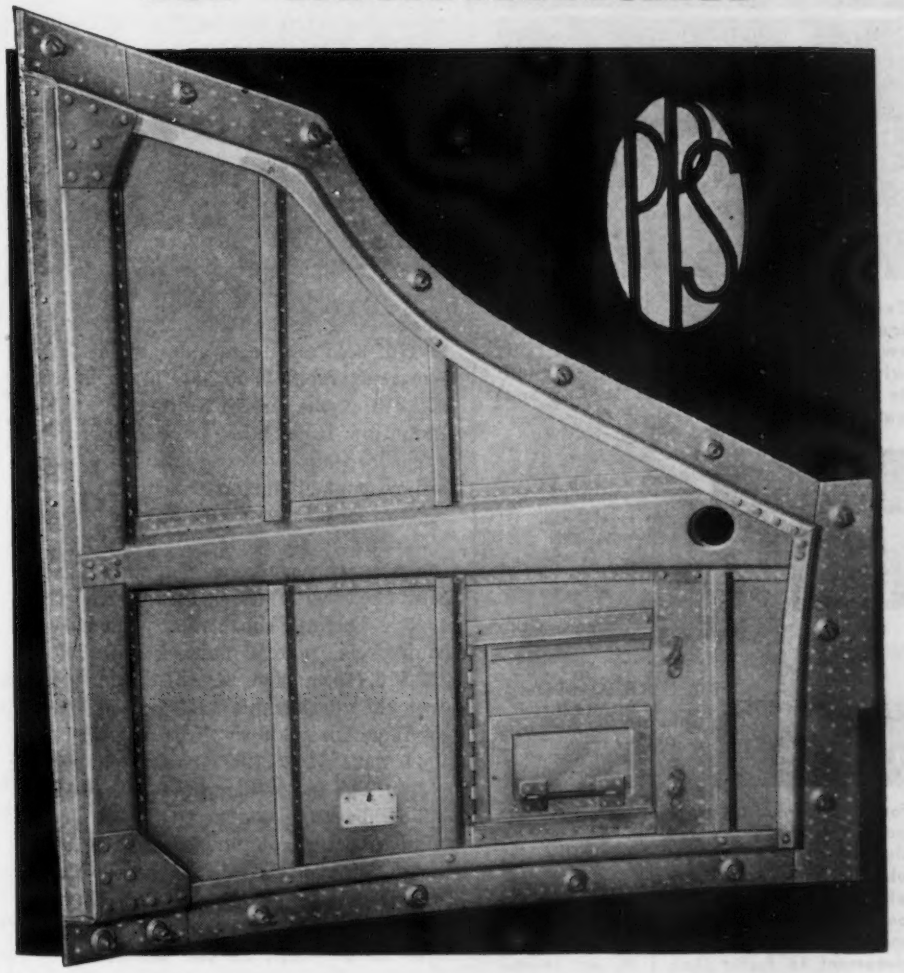
• • • **The Pittsburgh Steel Co.** has appointed a rehabilitation officer to help its veterans returning after being wounded or injured, get suitable jobs.

Garrett Connors, vice-president in charge of industrial relations, told a Congressional Committee which is inquiring into the way disabled persons are being cared for by industry, that 152 of his company's approximately 6100 employees are listed as being "handicapped."

The company also has 194 employees beyond 65 years of age including 94 who are over 70. He said 257 of approximately 3000 employees who went into the armed services have returned, including some who have been injured. Michael Lombardi, of Charleroi, has been given the job of rehabilitation officer, Connors said. Lombardi has extensive experience in handling veterans' problems through long service with the American Legion. He is a District Deputy Grand Exalted Ruler of the Elks.

Connors also told the committee a survey had disclosed the "handicapped" workers had a 21 per cent higher rate of attendance to their jobs and were rated about 7 per cent more efficient than unimpaired employees.

Parish-fabricated **in aluminum**



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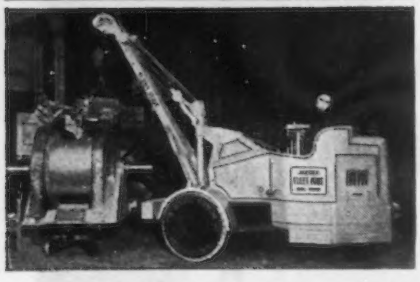
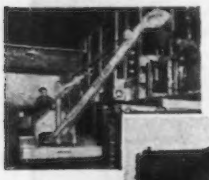


Telescopic 12-18 ft. boom (or tier loader if desired) lifts up to 5 tons, swings full load 90° to either side without outriggers, totes it at speeds to 12 m.p.h. Turns in 10½ ft. Can spot cars, pull loaded trucks.



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Three-point mounting with boom load centered on the driven wheels gives maximum maneuverability, stability and traction—can swing 90° to either side to pick up or deposit load. Heavy duty industrial gasoline engine, 4 travel speeds, automotive type controls; punctureproof cushion rubber or dual pneumatic tires. Ample traction to move loaded trailers, spot railroad cars. Operator always has clear view of boom and roadway.

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Westinghouse Report Shows New Records In Production, Sales

Pittsburgh

• • • **Previous production** records of the Westinghouse Elec. and Mfg. Co. were shattered during the first nine months of this year, with total output of war equipment amounting to $612,099,591 in sales billed, it was reported recently by A. W. Robertson, chairman of the board. This figure is 22 per cent ahead of the same period in 1943.

"The high level of our manufacturing operations," Mr. Robertson stated, "has enabled the Company to reduce its backlog of unfilled orders (exclusive of held and terminated orders) 27 per cent, from $906,200,874 to $655,509,213 at the end of September. This reduction in backlog is considerably greater than the reduction in new orders booked during this period."

New orders, amounting to $606,703,566, decreased 21 per cent during the first three quarters of this year, compared with the same period in 1943. During the same period the company's federal tax bill totaled $69,513,715, an increase of 21 per cent over the comparable 1943 period. Net earnings for the first three quarters of 1944 were $16,711,097 compared with $14,491,608 in the same period in 1943.

The directors learned that employment at the company's East Pittsburgh Division is now at an all-time high level of 28,000 people, 27 per cent of whom are women, compared with 12 per cent as the normal proportion of women employees. Shipments from the East Pittsburgh Works are now between 1300 and 1500 carloads a month.

Three-Day Meeting To Cover Stress-Corrosion

New York

• • • **One of the most baffling** of all metallurgical phenomena—the premature failure of metal sections caused by a combination of stress and corrosion—will receive a thorough airing at the joint symposium on stress-corrosion cracking, sponsored by American Society for Testing Materials, and the Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, and scheduled for Hotel Benjamin Franklin, Philadelphia, Nov. 29, 30 and Dec. 1, 1944.

Stress-corrosion cracking is encountered in a wide variety of metal-

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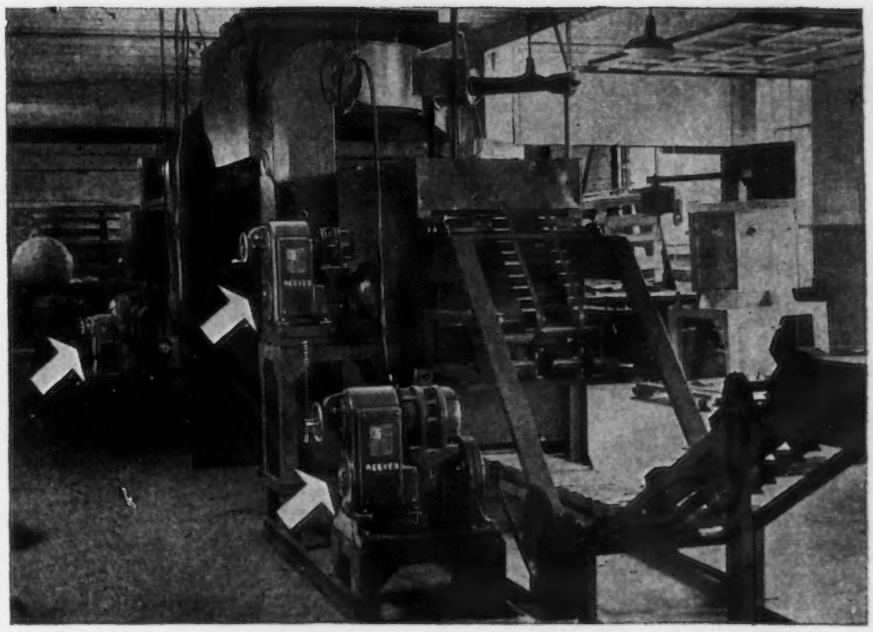
lic materials including brass and other copper-base alloys, aluminum and magnesium alloys, zinc, lead, and nickel alloys, and in many steels, especially the stainless varieties, and galvanized sheet and wire. The phenomenon is of wide engineering significance and a large amount of research work has been done and is now going on, and a number of theories have been advanced to explain the effect of stress, environment, time, and internal structure on the stress-corrosion susceptibility of the material. This work has resulted in developing a number of cures for the condition but it has also uncovered many puzzling and apparently contradictory facts, and it has been evident for some time that a thorough-going discussion of all phases of the phenomenon would produce results.

At the forthcoming symposium 30 technical papers will be given covering all phases of the subject and including a large amount of data released by the War Department for this meeting. There will be a free discussion of methods used to detect stress-corrosion cracking and there will be seven or eight papers on the cracking of brass, in two sessions on Nov. 29, and in the morning session Nov. 30. This will be followed by two sessions, that afternoon and evening, on stress-corrosion cracking in aluminum and magnesium alloys, and one session in the morning, Dec. 1, on stainless steels and galvanized sheet. At the last session that afternoon papers on the susceptibility of nickel and lead alloys will be presented.

Of interest to all who have encountered stress-corrosion cracking in any metallic material, is the broad survey of the field, to be given after the dinner on Nov. 29, by E. H. Dix, assistant director of research and chief metallurgist, Aluminum Co. of America. Mr. Dix's paper will be printed as the introduction to the special volume to be available soon after the meeting and which will contain all of the symposium papers and a transcript of the discussion at the meeting. The symposium will end, and the published volume will conclude, with a summary by E. A. Anderson, chief of the metal section, Research Division, New Jersey Zinc.

The technical session on the evening of Nov. 29 will be preceded by an informal dinner sponsored by the Philadelphia District Committee of ASTM and the Philadelphia Section of AIME. The after-dinner speaker will be Ralph Kelly, president, Baldwin Locomotive Works.



Three-deck oven showing three REEVES Motodrives

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who furnish REEVES Speed Control as standard equipment to insure most efficient operation under all changing conditions. REEVES units are easily applied to machines in service. Send for copy of catalog I-435 giving complete information on REEVES Variable Speed Drives.

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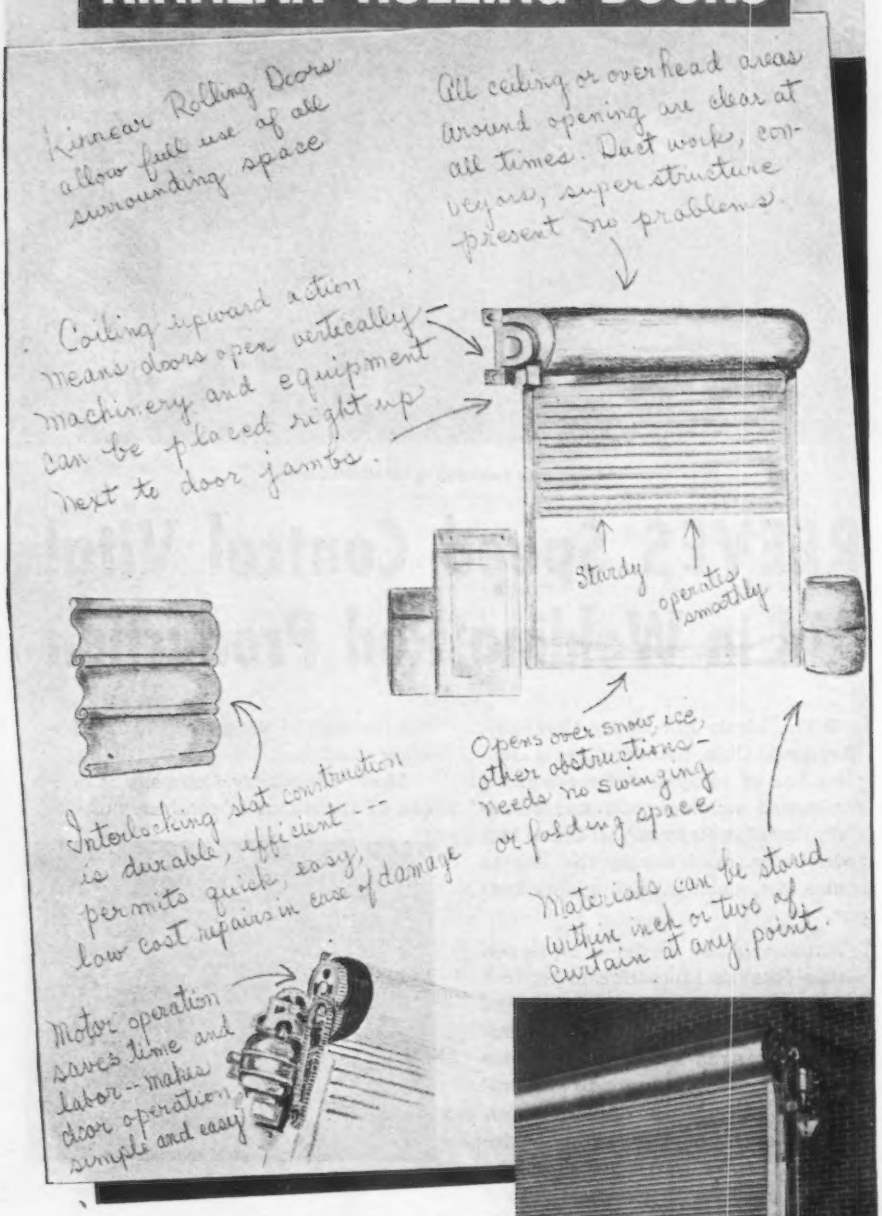
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SAVING WAYS IN DOORWAYS — KINNEAR ROLLING DOORS

Newest Weapons Are Cause of Remaining Manpower Headaches

Washington

• • • **The often mentioned** "changes in tactical needs of the Armed Forces" is affecting the national manpower situation, according to statements made recently by Paul V. McNutt, chairman of the War Manpower Commission. Needs for rocket powder, developed since original ordnance programs were laid down, and in the production of certain types of heavy artillery ammunition and tanks are in the critical stage at the present time.

Mr. McNutt cited the heavy artillery ammunition program as typical. "Thus far," he said, "manpower has been of only secondary importance. The major factor has been the lack of production facilities. These facilities, however, are now nearing completion and as soon as completed must be staffed. Many of them are located in areas already suffering from lack of workers. In the very near future manpower or the lack of it will be a decisive factor in the success of this program."

According to the WMC chairman, the heavy artillery ammunition program for the remaining months of 1944 and well into 1045 calls for sharp increases in production. He listed the increases as follows:

81 mm. for mortar—50 per cent increase.

4.5 in. shell—135 per cent increase.

155 mm. gun—12 per cent increase.

8 in. gun—120 per cent increase.

240 mm. howitzer—75 per cent increase.

"These are the goals," Mr. McNutt declared, "set by the Armed Forces."

Rocket ammunition is also scheduled for sharp increase, Mr. McNutt said. "There is a serious danger," he declared, "that in the near future we may have insufficient rocket powder to load rocket shells. The Army provides powder for the Navy program as well as its own and since some plants are behind schedule, there is a good likelihood that either or both Services may be handicapped by shortages."

Powder and loading plants, WMC head revealed, gained 8000 workers in mid-summer but this was far from sufficient to meet the needs of the expanding program. Employment in 27 reporting plants totaled 77,000 on Sept. 1 and was scheduled to expand

by almost 10,000 in two months and by 5000 additional in early 1945. Approximately 8200 jobs were open for immediate filling in September.

Mr. McNutt said that the production of rockets and rocket parts had been, thus far, up to assigned production quotas. Launchers are in ample supply and are being produced at a rate that will satisfy year-end requirements. The production of rocket parts involves relatively simple manufacturing operations permitting in-plant transfers and offers pleasant working conditions.

Concentration of the tank industry in areas of current and anticipated labor shortages threatens to make recruitment for the expanded program a difficult problem, Mr. McNutt continued.

It was stated by the manpower chief that in the past manpower had not been a factor hampering tank production. Recent reports from the nine firms engaged in the final assembly program indicated few, if any, had serious production difficulties resulting from lack of manpower.

"However," said Mr. McNutt, "full production of the M-36 tank destroyer and a modified medium tank, both considered exceptionally urgent by the War Department, was not scheduled to get under way until the first of October. Four of the nine firms suffered manpower declines between Aug. 1 and Sept. 1. In meeting the needs for the remaining months of 1944, we have not only to make up these losses, but also to fill the additional requirements of the program.

"Although manpower has been adequate in the past, future prospects are not so promising. The firms are located in areas already suffering from a scarcity of workers."

Mr. McNutt said that employment in the plants where tanks are assembled totaled 40,700 as of Sept. 1. The employment of 42,550 by Nov. 1 will be required to meet production schedules, he said.

High Level Seen For Aircraft Procurement

Pittsburgh

• • • **Regardless of contract** readjustments, emphasis on aerial warfare will keep aircraft procurement on a high level until victory can be "clearly foreseen," according to Col. A. H. Johnson, Supervisor of the Central Procurement District, AAF. Total shipments for September were $339,411,712. In August the total was $357,385,684.

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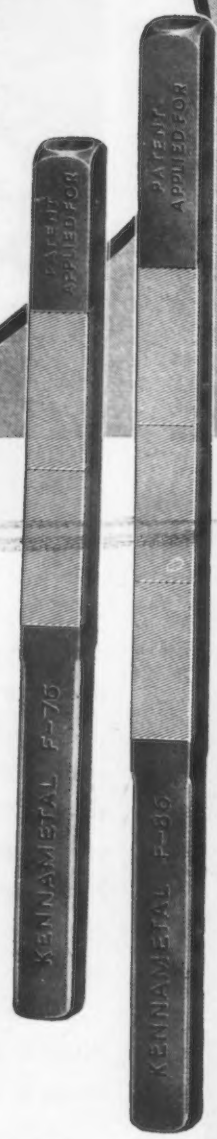

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Kennametal lathe files outlast steel files 50 to 200 times, because their surface is made of the same hard, cemented carbide composition as steel-cutting Kennametal-tipped tools. They permit filing speeds 3 to 10 times those possible with steel files—doing an outstanding job on cast iron and brass at surface speeds around 900 feet per minute, and on high-carbon, high-chromium steels at 800 surface feet per minute. The keen, sturdy teeth of a Kennametal file will make a clean, true cut on steels up to 62 Rockwell C, a hardness that ordinary files cannot touch.

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Kennametal Lathe Files are now furnished in two sizes—11" or 14" long—and each size is available with either 20 or 30 teeth per inch. The 11" size (F-76, 30 teeth/inch; F-77, 20 teeth/inch) having a filing surface 4" long x ¾" wide, costs $12.50. The 14" size (F-86, 30 teeth/inch; F-87, 20 teeth/inch) having a filing surface 6" long x ¾" wide, costs $18.50. All sizes can be shipped promptly.

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Contract Settlement Work Is Performed By AAF Specialist Teams

Dayton, O.

• • • **Efforts by the** Army Air Forces to speed contract settlement and reconversion to civilian production were stressed recently by Maj. Gen. Bennett E. Meyers, deputy director of the ATSC.

"Today we are training over 3000 carefully-selected officers to handle the complicated details of contract termination quickly and fairly," Gen. Meyers declared. "They are being trained in such institutions as the Harvard School of Business Administration and the Army Industrial College at Washington, D. C.

"Our choice falls on men who in civilian life were successful bankers and corporation executives, recognized lawyers, property managers and production experts. Once trained, they work in teams composed of a contracting officer, a negotiator, property disposal officer, legal officer and an accounting officer.

"We are training qualified men to handle the Army's part of the termination job and offering to manufacturers all the information at our disposal that will help them in winding up the contracts on their own end. The faster the manufacturer can function in listing his inventories and in submitting his statements and his subcontractors' bills, the more efficiently we can operate. In each of our six procurement districts we invite manufacturers to atend meetings, or to send representatives there, where we show them the steps they should take in preparation for termination, and what requirements must be met. Sessions vary from one-day meetings to courses that last over several days."

New York Seeking Enlarged Exports

Albany, N. Y.

• • • **Maintenance of present** production in New York State should be aided in the postwar period by the further development of foreign markets for local products according to M. P. Catherwood, Commissioner of the New York State Department of Commerce, "Numerous foreign government purchasing commissions are already in this country, contracting for machinery and semi-processed goods to be shipped as soon as the

work of rehabilitation begins," said Commissioner Catherwood. "Our representatives are now in contact with many of these Commissions as well as with purchasing agents for private firms in Europe, South America and the Near East."

The typical purchasing program for reconstruction and expansion of international economic welfare contains the following items, taken from a list furnished by the Chief Procurement Officer for the Provisional Government of France: metalworking and woodworking machinery, electric motors and switches, hand tools, general hardware, prefabricated houses—both steel and wood—and harbor equipment such as tugs, dredges, cranes, marine Diesel engines, anchors and chains, capstans and winches. Many of these items are normal civilian production in New York State plants, and contact between such manufacturers and the French Procurement Office is being arranged.

A representative of the Mexican Purchasing Commission recently disclosed its requirements for an industrial development program. These include road building equipment, agricultural equipment, pumps, engines, motors, rail, pipe, valves, and machine tools.

Chicago Has Plan For Public Works Program

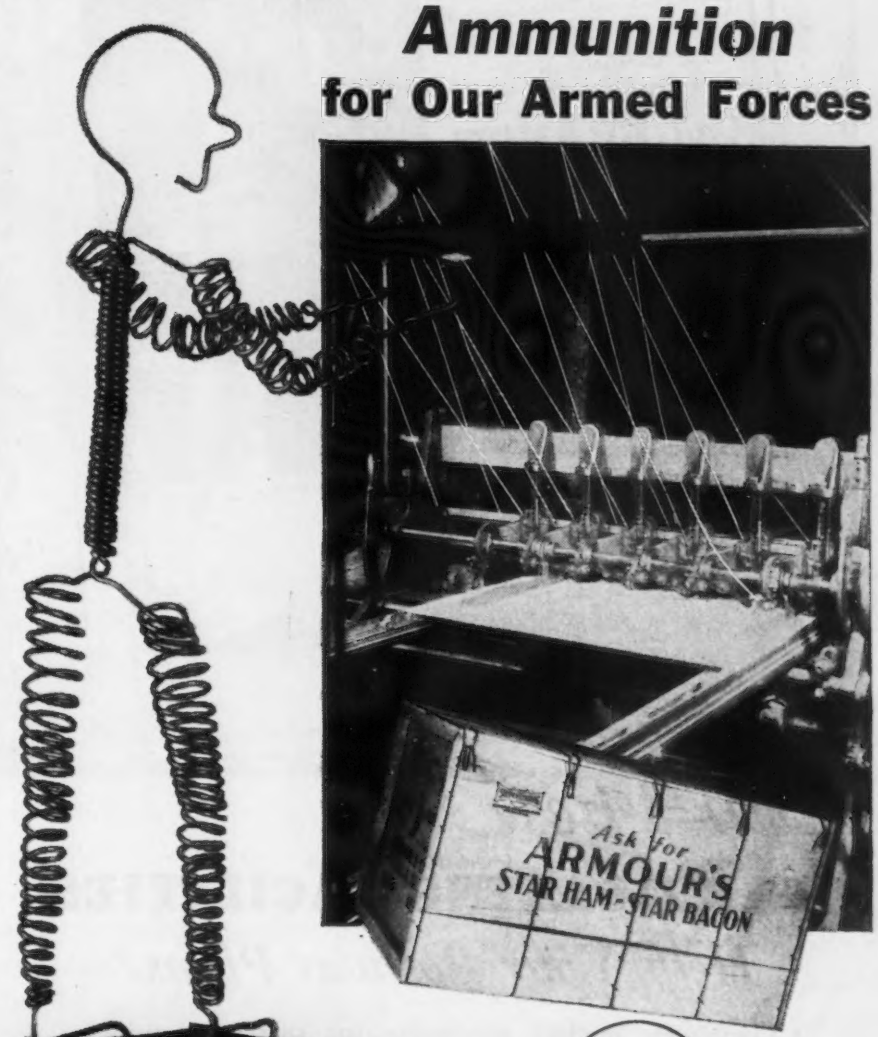
Chicago

• • • **A post war construction program involving $902,206,000 in public works and improvements is being considered by the Chicago City Plan Commission, it was revealed at a recent meeting.**

Included are super highways, airport, schools, playgrounds, parks, sewage disposal system improvements, and other public works. Originally the program contained provisions for the expenditure of $1,500,000,000, but revisions cut it to the lower figure, it was stated. Completion will require from five to 10 years.

The largest expenditure will be for super highways, $182,466,000. Subways will take $155,200,000; sewage system improvements $99,000,000; parks and playgrounds $59,000,000; and schools $24,000,000. Funds are to be provided by federal grants, taxation and other sources of income. The actual programs must be vitalized by government units after recommendation by the commission.

Packaging Food and Ammunition for Our Armed Forces



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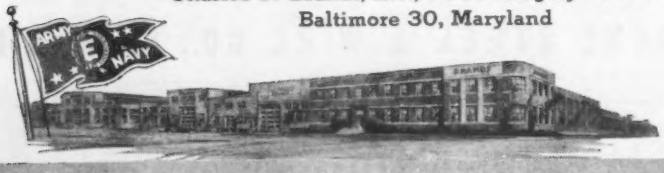

BRANDT of Baltimore • Craftsmen in Metal Since 1890

Canadian Production Summary Shows 7637 Water Craft Built

Ottawa

• • • **Canada's war production** record as of August 30, 1944, according to figures released by the Wartime Information Board, showed that a total of 7637 cargo ships, tankers, combat vessels, tugs and other types of water craft have been produced in Canadian yards.

Service and trainer aircraft produced in Canada to the end of August numbered 13,457, while Army vehicles, including armored units, tanks, universal carriers and motor vehicles, totaled 699,100 units.

Communication equipment manufactured in Canada during the same period was valued at $302,000,000 and various other types of instruments were valued at $104,000,000.

Other production figures made public for the period from the outbreak of war to August 30, include:

Guns and small arms—machine guns, rifles and mortars, 1,305,884 units; guns or barrels or mountings, 118,000 units; heavy ammunition, filled, 100,000,000 units. (In addition, some 25,000,000 shells, cartridge cases or other components have been shipped abroad.)

Small arms ammunition: 4,000,000,000 rounds. (This figure includes 37,000,000 rounds of 20 mm. ammunition for guns firing fused shells.) Chemical explosives, 1,374,526 tons.

Packaging Engineers Form Organization

Chicago

• • • **The Industrial Packaging** Engineers Association of America, with National headquarters in Chicago, has been formally organized and a general meeting will be called in December.

The new association will stress the practical side of product protection, and will promote engineering practices and research in the industrial packaging field. An educational program, with provision for dissemination of data among its association members has been planned.

Officers were elected at a preliminary meeting Oct. 24 headed by R. F. Weber, International Harvester Co. M. H. Allen, Dodge-Chicago Div., Chrysler Corp., was elected vice-president, and D. H. Irwin, Sangamo Electric Co., Springfield, Ill., treasurer. In

addition to these officers the executive committee will be composed of Paul O. Vogt, General Electric Co., Ft. Wayne, Ind., and J. E. Murray, Navy Department, Bureau of Yards & Docks, Chicago. Irving J. Stoller will be executive secretary, with offices at Room 2502, Tribune Tower, Chicago.

At the outset, special attention will be given to export packaging. One of the first tasks of the association will be to sift accumulated packaging experiences gained under war time operating conditions, and to codify the best of these into recommended packaging standards.

ATSC Reorganizes Its Purchasing Department

Wright Field, Ohio

• • • A streamlined reorganization which centers in one division of the Air Technical Service Command the functions of buying and supervising production and inspection of aircraft for the Army Air Forces has been announced by ATSC headquarters here.

The new division, called the Procurement Division, is one of six set up in the unification of the former Air Service Command and Materiel Command under Lt. Gen. William S. Knudsen and his deputy director, Maj. Gen. Bennett E. Meyers.

Heading the Procurement Division is Brig. Gen. Orval R. Cook, a veteran of 22 years' service in the AAF, including more than 10 years at Wright Field. The Procurement Division's deputy chief is Col. Donald C. Swatland, an infantry lieutenant overseas in the last war and a nationally prominent corporation lawyer, who volunteered for Army service early in 1942.

Also on Gen. Cook's executive staff are Mr. W. E. Donnelly, assistant to the Chief, Col. H. A. Shepard, chief of the Division's control section, and Maj. W. T. Tutt, Gen. Cook's administrative assistant.

The Procurement Division has a twofold job. First, it helps AAF headquarters determine what types of aircraft can be produced in quantity to meet the Army's current and anticipated requirements. Second, it procures from the 15,000 manufacturers in the aircraft industry the 450,000 items, from complete B-29s to the goggles in a flyer's helmet, which the AAF requires, and sees that the schedules and specifications are met.

C. M. H. Stainless Steel BELLOWS Are Standard Production Items

C. M. H. Stainless Steel BELLOWS are standard production products; hence, shipping delays are minimized. All the advantages of *Stainless Steel* have been utilized in the art and craftsmanship of C. M. H. BELLOWS. They are the solution to both difficult and urgent requirements.

C. M. H. Stainless Steel BELLOWS are corrosion resistant and operate efficiently at either high or low temperatures. They have the qualities required for handling high pressures—which may be further increased by multiple ply construction, where needed. Ferrous fittings attached by circular seam welding, give uni-metal assembly and assure non-corrosion of the assembled parts.

C. M. H. engineers and production will help you solve your immediate bellows problems—where they are to be required for valve stem housing on vacuum equipment, thermostats, pressure controls, valves, recording instruments, hydraulic mechanisms, rotating shaft seals, or other purposes. Write for complete information today.

Ask for Chicago Metal Hose Engineering Take-off Form SSB2 on which to submit your bellows requirements. It will save you time—assure more accurate, expeditious handling.

Flexible Metal Hose for Every Industrial Use

CMH CHICAGO METAL HOSE CORPORATION
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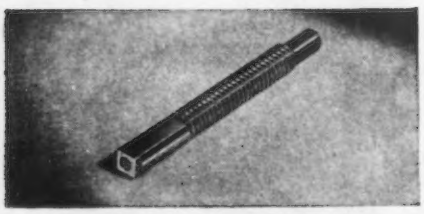
Plants: Maywood and Elgin, Ill.

PRECISION PARTS



ACE MACHINING ON THE BEAM

This is a vital part of an air-borne instrument. Its beam picks out a bomber's target below the clouds. It helps bring the crew home safely after the mission. It helps avoid mid-air collisions.

Ace manufactures these parts complete from stainless-steel bar-stock. Each piece is roughed out on a screw-machine and then the square milled on the end. It is then cylindrically ground and the flats are surface-ground. After completing these operations, the threads are ground from the solid blank.

Working with close tolerances on a mass-production basis is an Ace accomplishment that offers many worthwhile advantages. If you are thinking in terms of small parts or assemblies, it will pay you to consult with Ace. Send sample blueprint or sketch for quotation.

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ACE MANUFACTURING CORPORATION
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Whether your job requires machining, grinding, or stamping . . . and whether it involves drilling, threading, or hardening . . . Ace is set-up to handle each operation. Responsibility at Ace is not divided. Time at Ace is not wasted.

Iowa State Intervenes In Freight Rate Case

Chicago

• • • On behalf of Iowa steel consumers, the Iowa State Commerce Commission has intervened in the sprawling I. & S. 5268 freight rate case in briefs filed with the Interstate Commerce Commission.

The case, which involves rates on iron and steel articles shipped from Illinois and western trunk lines territories to Iowa, Minnesota, Upper Michigan and Wisconsin, has been the subject of lengthy Interstate Commerce Commission hearings for several months. The hearings have been adjourned to Jan. 1 to permit introduction of more evidence.

The proposed new rate schedules were suspended last year pending investigation by the Commission. On certain items, the rate to Minneapolis from Chicago would be raised 12c. per 100 lb., and to Duluth from Chicago 13c. per 100 lb. Shipments from St. Louis to Minneapolis would be raised 17c. per 100 lb. and to Duluth 16c. per 100 lb.

The Iowa intervener substantiates assertion by other commercial groups that local fabricators at remote points would be adversely affected.

Chinese Nationals To Study Aircraft Output

Williamsport, Pa.

• • • Thirty Chinese Nationals, all graduate engineers, are to be given a year's training in production work and specialized occupations at the Lycoming Division of The Aviation Corp. here. The group is now en route to America from Chungking.

The training of the Chinese is covered by an agreement and contract between the Commission on Aeronautical Affairs of the Republic of China (Chinese Air Forces); the U. S. Army and Lycoming. They also provide for the licensing for manufacture, assembly and sale of Lycoming aircraft engines and spare parts in the Republic of China.

Following the year's training at Williamsport the group returns to China to supervise the manufacture and assembly of these Lycoming engines there.

The arrangements are the result of negotiations between Maj. Gen. P. T. Mow, Lt. Col. S. C. Wang and Capt. W. Z. Hwa of the Chinese Air Forces and William F. Wise, executive vice president of The Aviation Corp. and the Lycoming Division.

(Advertisement)

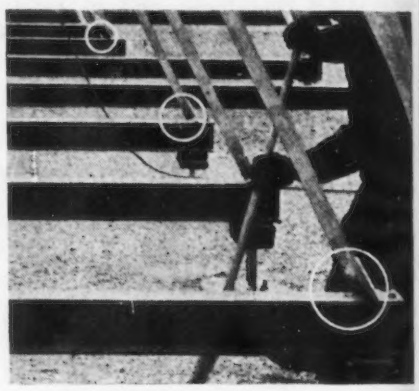
Residual Heat Used for Regalvanizing

By GEORGE H. OHMER
Chief Engineer

Dayton

• • • Product design engineers working with galvanized sheet metal are acclaiming the Galv-Weld Process as a means of improving quality while lowering manufacturing cost.

Lower manufacturing cost is attained by abandoning the method of joining galvanized sheet metal by riveting and soldering, and replacing this laborious operation with welding which is considerably faster and more economical.



PROTECTED JOINTS: *Large galvanized structural steel frame with welded joints protected against rust and corrosion by Galv-Weld.*

The welds are regalvanized with Galv-Weld Alloy at the time of welding by making use of the residual heat to melt or flow on the alloy. Welded seams provide a leakless and vibrationless form of construction, while the Galv-Weld coating insures protection against rust and corrosion equal to and/or better than the original hot dip galvanizing.

These advantages are reflected in the wartime experience of a large railroad company which recently "completed a number of large cans which were made of No. 16 galvanized iron with inset flanged heads, and instead of using the customary rivets and solder they welded the heads in and treated the welds with Galv-Weld Alloy." They saved labor and entirely eliminated the use of Victory Solder which will stand very little abuse.

These economies can be effected by every manufacturer of metal cleaning equipment, industrial washers, dust collectors, air conditioning duct work for process industries and every other manufacturer using galvanized sheet, shapes and pipe through the use of welding and Galv-Weld Alloy.

Regalvanizing with Galv-Weld Alloy is permanent; once applied the coating will not chip, peel or crack even when the base metal is stressed the elastic limit. A comparison of Galv-Weld coatings with zinc sprayed coatings has conclusively proven that Galv-Weld is superior in all ways. It has a better bond, it will resist corrosion longer, it does not require sand or grit blasting, nor any special or expensive equipment for application.

Details may be secured from Galv-Weld Products, Dayton 10, Ohio.

Tin Plate Quotas Arranged to Supply Meat for Services

Washington

• • • A joint statement recently by WPB and WFA said that monthly tin plate quotas of meat packers in November and December will be used in such a way as to make more tinned meat available for military purchase.

During November and December, when an estimated 25 to 30 per cent of the year's tinned meat supply is packed, packers will be limited to 15 per cent of their annual tin plate quotas for civilian distribution. This 15 per cent of annual quota (7½ per cent in each of the two months) is slightly less than one-sixth of the 12-month quota. Tin plate used for the remainder of the pack—beyond that authorized for civilian distribution—will be used entirely to can meat for government account.

WFA officials said the Armed Forces' requirements for tinned meats are greater than would be supplied under unregulated use of the available tin plate. Last week's action, Direction 5 to WPB Conservation Order M-81, does not affect the packing of meat in glass, it was pointed out.

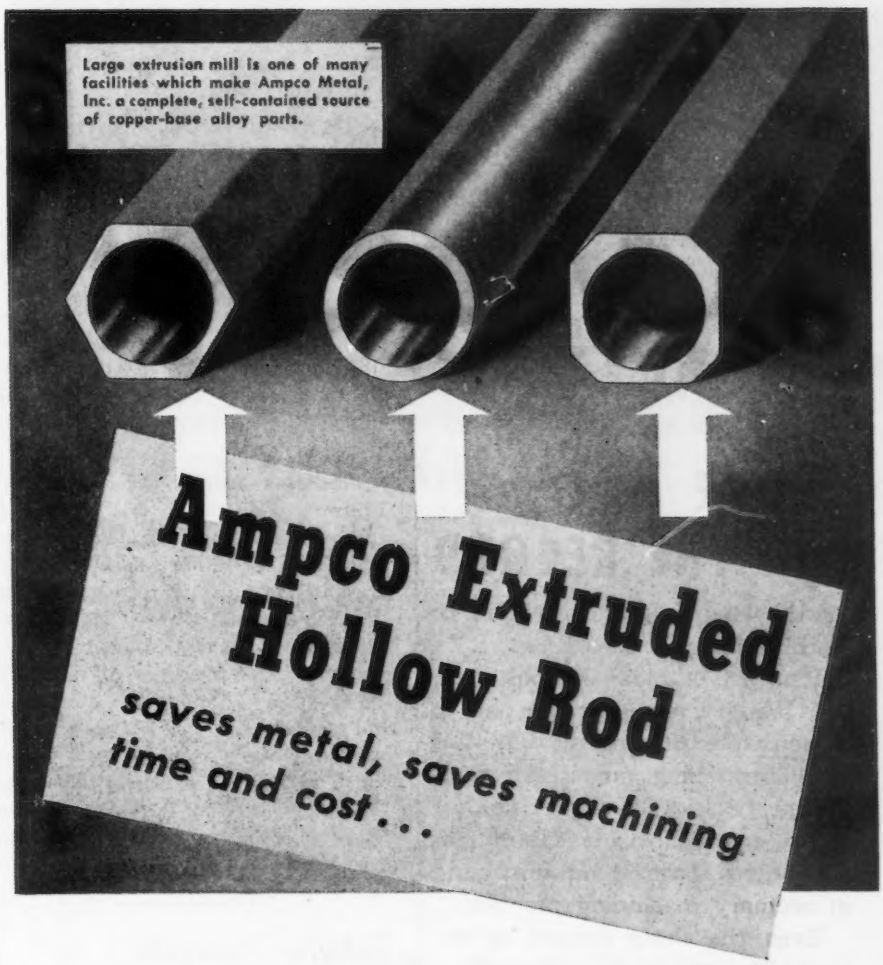
General Electric Gives Refresher To Engineer Veterans

Schenectady

• • • **Returning from service** in the Army, Navy or Marine Corps, the average sales engineer finds that he has a lot to learn and re-learn about the company he left. Policies have changed; facilities have been enormously expanded; the apparatus itself is in many cases new and different.

To meet this condition General Electric has established a "refresher" program to assist returning sales engineers to find their normal places in the company in the shortest possible time. An idea of how the plan works may be gleaned from examination of a typical case.

Ralph S. Fifield, a salesman in G.E.'s St. Louis office since 1917, was called to active duty in the Army in 1940. He served as a lieutenant colonel in the infantry; was honorably discharged in late August because of illness. Reporting back to General Electric, he was asked to go to Schenectady, there to start on a


Large extrusion mill is one of many facilities which make Ampco Metal, Inc. a complete, self-contained source of copper-base alloy parts.
Ampco Extruded Hollow Rod
saves metal, saves machining time and cost . . .

All the inherent advantages of Ampco Metal — its exceptional resistance to wear, impact, fatigue, and corrosion—its specific properties as an engineered aluminum bronze alloy, held within close limits by rigid quality control — are available to you in this convenient form.

Ampco Hollow Rod actually is replacing forged material in valve seats for aircraft engines — evidence of its clean, sound structure and excellent physical properties. It is intended primarily for bushings, sleeves, lead-screw nuts, and similar machine parts. Sizes closely parallel most requirements — saving material and time.

Ampco has a specialized engineering and production "know-how" — and the complete facilities for parts production by the process that *should* be used for *your* purpose. Ampco's nation-wide organization of field engineers is ready to assist you. Call on us. Write on your business letterhead for your copies of Engineering Data Sheet 125 and the Ampco Metal Catalog.

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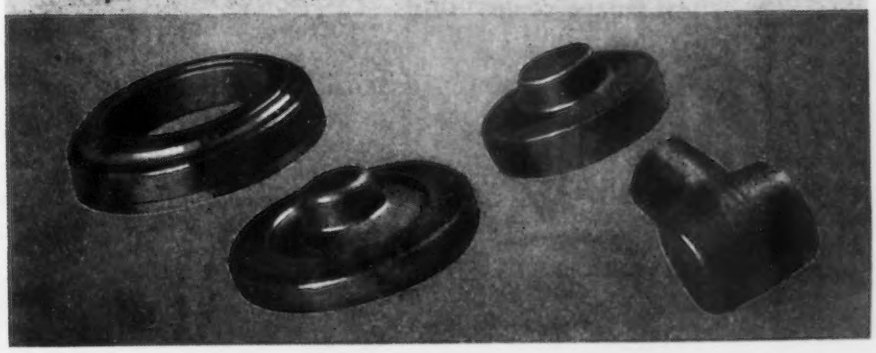
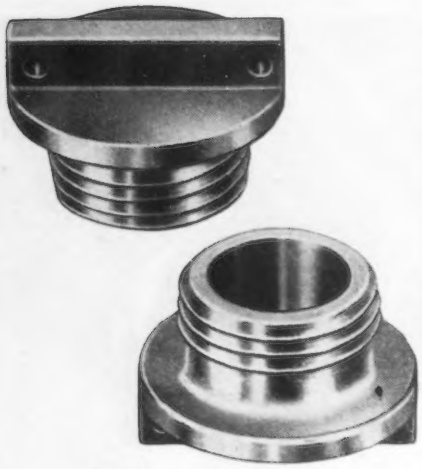
A-5B

Ampco Metal Parts fabricated from extruded stock





ONE FOR THE RECORD

. . . the long, impressive record of Corbin's fine precision work.

It might be more obvious if we used a larger, more intricate part to demonstrate our point. But this small brass plug, an aircraft component, packs a lot of precision for its size — and illustrates a thorough-going attention to detail not found in ordinary machining practice.

Even the sharp corners of the head-slab were not neglected . . . they were removed by a hand operation. This was not a vital operation, admittedly, but it is typical of Corbin's concern for detailed finish. Adding "plus" to specifications is a Corbin habit.

Corbin's modern methods and thousands of latest type machines can find *economy* as well as exact precision — in the toughest blueprint. PI

Some of our facilities may be available *now*. Send us your blueprints and specifications for prompt, helpful study of your precision requirements.

THE CORBIN SCREW CORPORATION
The American Hardware Corporation, Successor
NEW BRITAIN, CONNECTICUT

CORBIN

PRECISION PARTS

month's tour of the company's main apparatus factories.

The second former G-E engineer to make the tour, he traveled the now standard route—from Schenectady to Pittsfield, to the River Works, to West Lynn, to Philadelphia, to Schenectady, to Erie, to Fort Wayne, and back at last to his home base. When he had finished, Fifield bubbled over with enthusiasm for the new program. He said that it not only brought him up to date on activities, but also helped him to get back into civilian life.

This was exactly the reaction the Training Committee had hoped for and will continue to hope for as several hundred other sales engineers presently in uniform return. Because as the committee has stated, "the prime objective of this program is to provide returning service men with the necessary information, enthusiasm and confidence in themselves, their fellow employees and the company, which will enable them to do an outstanding job for customers, themselves and the company in whatever work may be assigned them."

Tubular Products Restrictions Out

Washington

• • • **Because of the type** of steel used, chiefly small sizes of Bessemer tubular steel, is no longer in short supply and further control is unnecessary, WPB has revoked L-225, which controlled the manufacture and sale of electrical conduit, electrical metallic tubing and raceways.

Manufacturers and distributers, formerly permitted to sell conduit tubing and raceways only on preference ratings of AA-5 or better, may now make unrestricted sales as a result of the revocation of L-225. Production is expected to increase somewhat, WPB said.

Rustless Net Shows Decline

Baltimore

• • • **Rustless Iron and Steel Corp.** reports net earnings, after provision for income and excess-profits taxes but before renegotiation and subject to audit, for the nine months ended Sept. 30, 1944, of $1,394,964.39, equal after preferred dividends to $1.43 per share of common stock.

This compares with $1,864,271.49, equal to $1.94 per share of common, in the like 1943 period.

TWO FOR SPEED RECORDS

Nothing speedier than a power-driver for assembly-fastening—providing its "running mates" can stand the pace.

Corbin and Corbin-Phillips Screws are "fast company." Rugged, clean-cut, correct to the last detail, they'll take anything a power-driver can give — with no stray irregulars to mar an assembly or hold up production. . . . *They're uniformly accurate!*

For smoother, *undelayed* fastening: specify Corbin and Corbin-Phillips. SNU

CORBIN-PHILLIPS and REGULAR SLOTTED

Also AIRCRAFT Screws and Nuts to Governmental specifications.

See your Distributor

— also complete stocks at Chicago, New York and New Britain . . . and sales representatives who can "talk shop." Write for Catalog.

THE CORBIN SCREW CORPORATION
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CORBIN

SCREWS • NUTS

Alloy Steel Scrap Restrictions Are Modified by Board

Washington

• • • **Pointing out that** they do not indicate any relaxation of government controls over the grades and relative quantities of alloy steels that the mills will be permitted to produce, WPB on recently announced two revocations relating to alloy steel scrap consumption and segregation. These revocations eliminated Direction 4 to Order M-21-a, and Order M-24-c. The direction required specified percentages of alloy steel scrap to be consumed in the manufacture of certain grades of alloy steel. The revoked order provided for mandatory segregation of alloy steel scrap from carbon steel. It further prohibited use of certain grades of alloy steel scrap in the manufacture of carbon steel.

The industry, however, was told that it must continue to recover the largest possible tonnage of alloys from scrap and must also retain the present production pattern in order to avoid shortages in virgin alloys.

Revocation of Order M-24-c does not mean that segregation of alloy steel scrap is now unnecessary, WPB officials said. Steel mills in need of alloy-free scrap may control the quality of the scrap by their own purchasing policies. Voluntary segregation of alloy steel scrap should be maintained by producers and dealers, government officials pointed out.

Russia Looks to U. S. For Mine Machinery

Chicago

• • • **Reports are prevalent** here that Russia hopes to secure $150,000,000 worth of mining machinery from the United States in the first postwar years or an amount roughly equivalent to this country's entire 1943 or projected 1944 production.

Figures recently released by WPB show that American production in 1943 amounted to $145,100,000 of which 87.2 per cent was shipped to domestic users and 12.8 per cent, including 2.8 per cent to Canada, exported.

For the first six months of 1944 American production was $71,300,000, or 98.3 per cent of the 1943 production rate. However, during this period, shipments to domestic mines were 1 per cent greater than in 1943 and exports leveled off the same extent.

QUALITY CONTROL...

Assures Easier Machining and Better Performance of Acme Aluminum Castings

The aluminum alloy castings that come to you from the Acme foundry are tested castings—put through every form of inspection and examination known to modern metallurgical technique.

X-ray inspection gives a clear and accurate picture of the casting's internal structure. To measure strength, bars from every melt are pulled to the breaking point on a tensile machine. And the completion of our spectographic laboratory has put at our disposal—and yours—the newest advancements in the scientific analysis of alloy metals.

Because of their accuracy and inherent quality, assured by our quality control, you will find Acme Castings require less machining time, reduce your cost per finished part. Your customers will get better performance from parts made from Acme Aluminum Alloy Castings.

The special advantages of Acme Castings should help you speed production and reduce costs. Acme engineers will be glad to submit recommendations, without obligation.

ACME *Aluminum Alloys, Inc.*

Formerly Acme Pattern & Tool Co., Inc.

DAYTON 3, OHIO

HEAT-TREATED ALUMINUM ALLOY CASTINGS

ACME PATTERN & TOOL DIVISION

PATTERNS · TOOLS · TOOL DESIGNING · PRODUCTION PROCESSING

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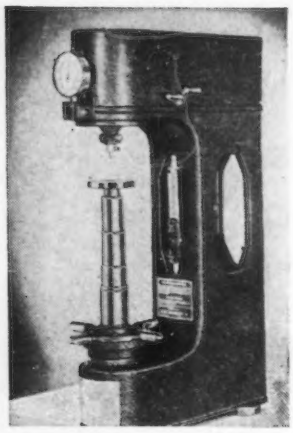
HARDNESS TESTER
For "Rockwell Testing"



The CLARK is an instrument of outstanding accuracy. It is built for years of trouble-free performance. Its design has been specially engineered to enable simple repairs and adjustments for wear to be made in the owner's own shop by competent mechanics using ordinary tools.

The CLARK Hardness Tester comes to you complete with the following standard equipment:

1. Telescoping cover for elevating screw.
2. Oil reservoir for elevating screw.
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4. 1/16" Hardened steel ball penetrator.
   1/8" Hardened steel ball penetrator.
5. Diamond cone penetrator.
6. Metal Dust Cover.
7. Adjustable steady rest.
8. Standard 3-1/2" anvil.
9. Checking anvil.
10. "V" anvil.
11. Test Blocks.

Learn the truth about hardness testing. Write Dept. IA for this free book.

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10200 FORD RD. DEARBORN, MICH.

Montana Corundum Mine Development Delayed by Weather

Washington

• • • **Wintry weather has delayed** initial production of corundum ore at Elk Creek, Mont., the WPB reported at a recent meeting of the Corundum Industry Advisory Committee but development of the mine during the winter is expected, followed by the erection of a mill in the spring.

It was announced also that the Bureau of Mines is re-examining corundum deposits in North Carolina but it was said that while good quality corundum may exist there the quantity so far indicated makes private operation questionable on an economic basis.

Average monthly imports of corundum ore declined during the third quarter of 1944, as compared with average 1943 imports, a government official indicated. The ore received was of lower quality, requiring the crushing of increased quantities of ore each month to supply primary grain requirements.

Production of corundum concentrate from a Canadian plant is now under way, with deliveries expected to average between 150 and 200 tons monthly, an FEA official reported.

Consumption of primary corundum grain by the optical and grinding wheel industry has dropped slightly to about 350 tons a month and is expected to remain low during the rest of 1944, WPB sources reported. Primary grain stocks, on Sept. 1, amounted to about four months' supply.

South American Tire Plant Ready January 1

Akron, Ohio

• • • **Production in the new** South American tire and tube plant being built near Bogota, Colombia, by the Industria Colombiana de Llantas, S.A. (Colombian Tire Co.), should start about Jan. 1. Stanley W. Caywood, general manager of the International Division of the B. F. Goodrich Co., announced that capacity of the plant will be around 100,000 tires and tubes annually, in addition to tire repair materials and automotive accessories.

This is about the prewar consumption of the country. The plant is expected to process between 700 and 800 tons of rubber annually.

YOU WANT ARC WELDERS WITH SCOPE

...AND YOU GET IT WITH HOBART MULTI-RANGE ARC WELDERS

1,000 Combinations
of voltage and amperage are available with Hobart Multi-Range Dual Control.

Remote Control
enables operator to select the correct welding heat for various procedures without returning to machine.

Polarity Control
is easy with Hobart. Just flip a switch for reverse or straight when desired.

HOBART WELDING ELECTRODES and Welding Generators are the right combination for better welding. Order yours today.

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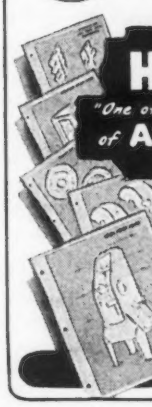
HOBART
"One of the World's Largest Builders of Arc Welders"



"Practical Design for Arc Welding" is essential to your post-war planning. Tells how to change to welded design and will incite your own ideas. First series FREE! Ask for it!

AGMA Meeting

(CONCLUDED FROM PAGE 68)

or contracting officer, a lawyer, an auditor, and engineer and a disposal officer. As many as 40 men have served on the team in important cases. Industry, he said, should set up corresponding individuals so that the separate legal, accounting, engineering and general management problems can be settled by the men most familiar with each of the factors involved. Before the team idea was applied, Colonel Fisher indicated that it was difficult to get a contracting officer to make a decision since there were many aspects of the problem about which he had only superficial knowledge.

The speaker pointed out that some 25 three-day courses are being set up on a collegiate level throughout the country to train men in industry how to conform with the new regulations.

Some of the provisions of the contract settlement bill pointed out by Colonel Fisher include: Partial settlement of claims pending a full check of figures; audit by the Comptroller General only for the purpose of detecting fraud; principle of fair and reasonable compensation; direct settlement between prime and subcontractors if competence is proved, although direct negotiation with a subcontractor is also provided. This latter clause, the speaker pointed out, is applicable where a prime contractor has been paid by the government, but goes into bankruptcy before the subcontractor is paid. In that case the subcontractor can file a separate claim and there is nothing in the law that would prevent such a payment being made twice, in effect.

In answer to a question from the floor, the speaker reiterated that the settlement boards were anxious to see that industry obtained a reasonable profit on any money spent on a partially completed contract. Time and again he stressed the words "fair" and "reasonable" and illustrated by examples how costs on even defective work could be absorbed, if it could be shown that scrap was produced in the starting stages of a new and unfamiliar job.

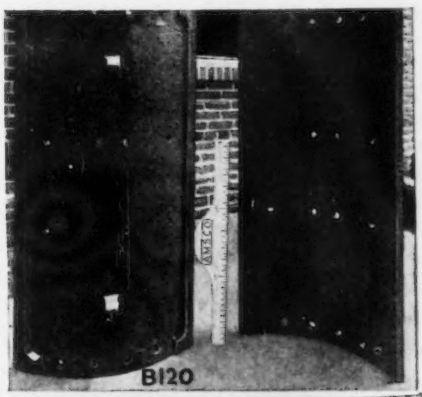
Tooling costs can be allocated proportionately to terminated contracts, even though the same tools may be in use on another contract still in force. "The tools are to be absorbed over all the contracts, anyway, after which they become the property of the contractor, so what is the difference?" Colonel Fisher philosophized.

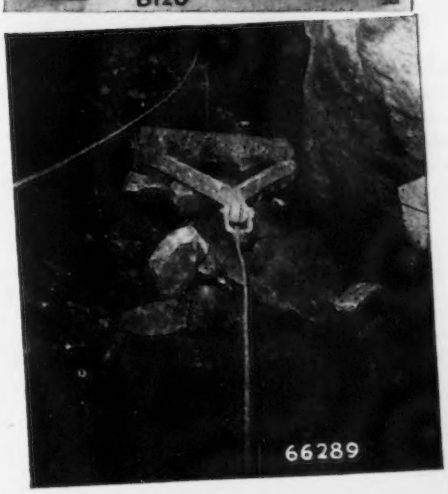
Record Output from Adirondacks Mines Aided by *"The Toughest Steel Known"*

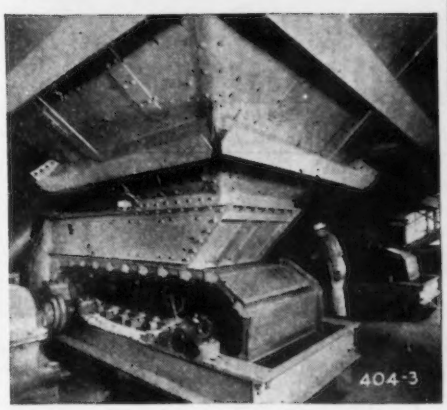
Additional millions of tons of iron ore are being poured into the war machine from the redeveloped, historical Adirondacks area where output has reached an all-time high.

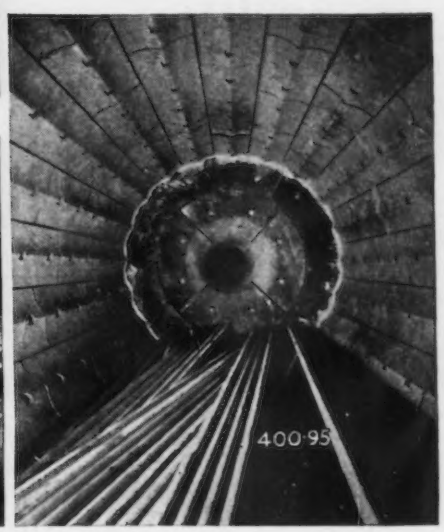
As in all metal mining and processing operations, the equipment used is subjected to stresses and abrasion that tend to destroy it quickly, causing high maintenance expense and production delays. The Adirondacks mines planned for longest equipment life and continuous operation by using austenitic manganese steel wearing parts wherever its application is logical.

Accordingly, such units as slusher hoes, apron feeders, gyratory, jaw and roll crushers, ball and rod mills, hoppers and chutes, and surface-operated power shovels are fitted with "the toughest steel known" wherever it will do the most good. Some of these applications are pictured.









B-120. Back castings for slushers or scrapers, such as those shown in picture 66289, used in underground mines for scraping ore from stopes to cars. The customer stated, "Manganese steel is specified because it is the best metal for resisting the stresses and abrasion in this work."

404-3. Two Stephens-Adamson Amsco apron feeders (Brayton patent) feeding ore to screens from storage bins. Maximum capacity 700 t.p.h. each.

400-95. This Allis-Chalmers 9' x 16' peripheral discharge rod mill, now dry grinding in an Adirondacks mine, is equipped with Amsco manganese steel liners.

Amsco "Conservation Welding Rods" described in Bulletin 941-W.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

MACHINE TOOLS

. . . News and Market Activities

Cleveland Machine Tool Firms Buy Patents for New Machines

Cleveland

• • • **Anticipating the day** when military orders will be non-existent, and their present jobbing contracts are terminated, machine tool makers here, most of whom are planning to build some sort of industrial machinery in the immediate postwar period, are buying up patents with possibilities for peacetime development.

Despite the queasy patent situation, some of the major producers have gone ahead and brought some new ideas, most of which have resulted from the war. One company has two new machines almost ready to go. One is a tapping machine on which they bought the patent and have since removed the bugs; and the other is a machine for working brass which they had been readying before Pearl Harbor. It should prove a profitable adjunct to the plumbing fixture industry.

Postwar orders are coming in, and copiously, but even with no major problems, putting a new machine tool on the market is a slow job, often taking two years' work before the first machine is sold. Contemplated panacea for the lull which the great number of new machines now in use and part of the government surplus will cause, new ideas are the answer here.

In the final analysis, it will benefit the machine tool industry if manufacturers buy into the government surplus and get rid of their old equipment which will raise their own efficiency and give the machine tool men a chance to get set with new lines. No one here is anticipating any rush for standard equipment after the war, with DPC warehouses packed.

Following the last war, it took most machine tool companies the next 15 years to build up to the size of their plants. How long it will take them this time, if ever, is an extremely speculative matter and some of the companies are not considering DPC housing at all. Expansion of the industry has surpassed that of World War I and with 600,000 government-owned machines as a potential market surfeit, most of them realize they are not going to sell much of their own equipment right away.

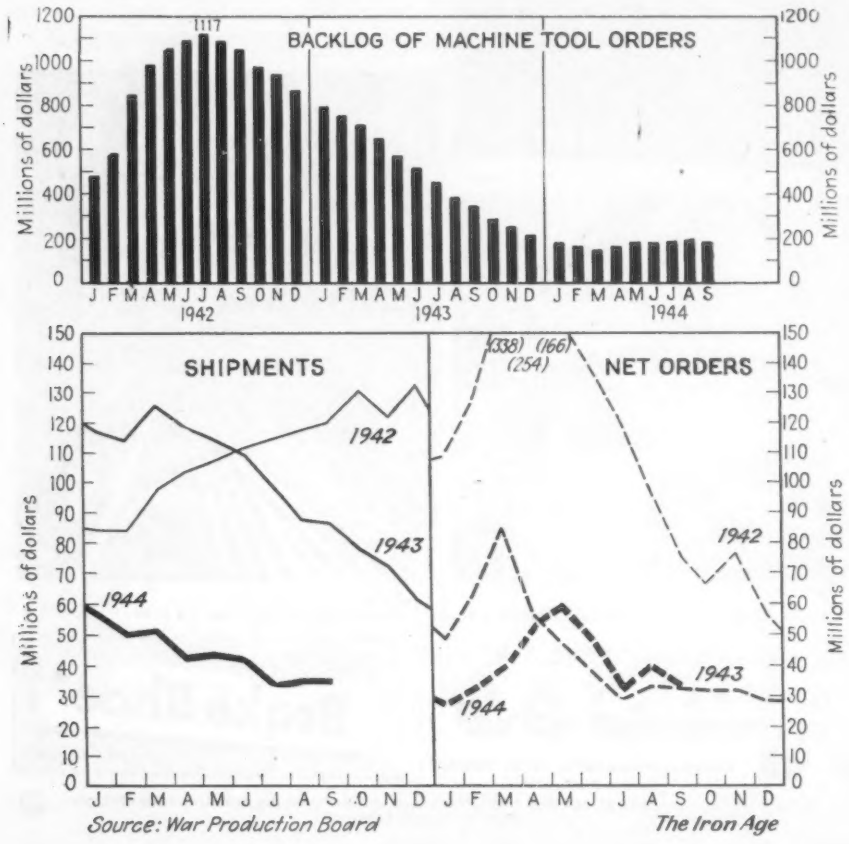
With the Russians apparently buying for postwar and rehabilitation, and one of the few potential customers for the surplus in a position to pay cash, the question arises as to what sort of arrangements may be made with Italy, France, and the destitute Chinese, who could admittedly absorb almost any amount of machine tools.

It was felt here that the President might name the three-man surplus board before election, and until he does, everything the machine tool men are worried about is still in abeyance.

Much of the government owned surplus is good equipment, less than two years old, and with 20 years as the average life of a turret lathe, for example, if the industry can look forward to a peacetime business of $400,000,000 a year, or about a third of their wartime peak, they will be happy.

Jobbers have already felt the effect of reduced priorities, with buyers planning for postwar and the military justly unwilling to let industry take its eyes off the ball.

• Rising 2 per cent machine tool September shipments reported by 199 firms totaled $35,876,000, or almost $700,000 over August, according to the WPB Tools Division. Net new orders—total orders less cancellations—amounted to $33,013,000. The backlog of unfilled orders in September was valued at $193,682,000, or a 1.6 per cent decrease under the August backlog of $196,760,000. About $9,298,000 of the September backlog is for unrated orders. Division officials said that maintenance of shipments at the present rate will require 5.4 months to fill the orders on hand at the end of September. Machine tools, these officials said, remain in critical demand for the heavy ammunition program and in certain Navy and air forces program.



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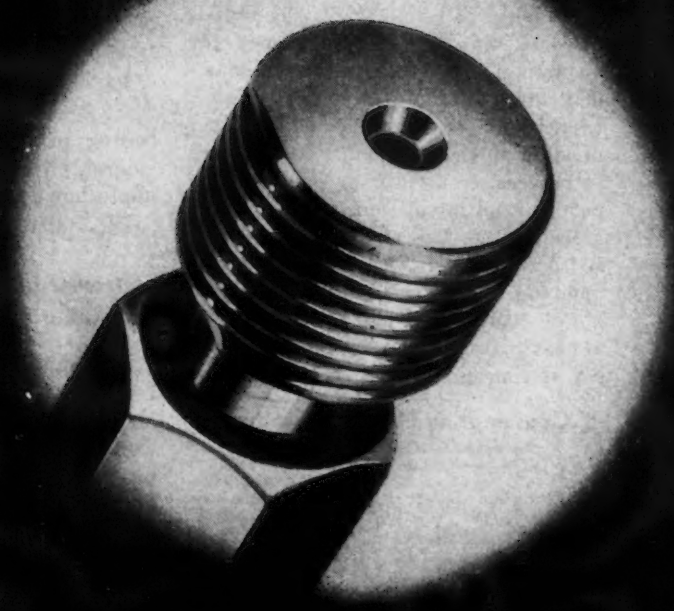

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CADILLAC *Thread* GAGES

NON-FERROUS METALS

. . . News and Market Activities

Limited Tin Supplies to Continue Postwar

• • • **The anticipated deficit** in tin supply vs. consumption during 1944 is expected to reach 12,000 to 13,000 long tons, according to Director Erwin Vogelsang of the Tin, Lead and Zinc Div. of WPB. The stringent control measures adopted by WPB and supported by industry have provided for tin conservation and replacement by substitute materials wherever possible to the extent that a 1941 consumption of 134,695 tons of pig tin was reduced to 85,687 tons in 1942, and 80,066 tons in 1943.

Mr. Vogelsang expects that controls over tin must be maintained for some time after the end of the war with Japan since he estimates it will be years before the great number of dredges are rebuilt or replaced, and the tin smelters are again functioning normally. Moreover, the supply of high grade concentrates from the Belgian Congo will probably decline when the natives return to gold mining after the war. Bolivia, he feels, has probably passed its peak as a source of supply, and while new treatment processes may result in greater tin recovery from the ores, this may serve merely to retard the trend. Combined imports of concentrates and pig tin in 1942 were 56,000 long tons, 1943—38,000 tons, 1944—estimated 50,000 tons.

The Texas City, Texas, tin smelter, established to refine low grade Bolivian ores, was originally designed for an annual production capacity of 18,000 tons of fine tin. The present capacity of 70,000 to 90,000 tons, depending upon the quality of the ore in process, resulted from expansion to permit smelting all concentrates available to the United Nations should British smelters be destroyed by bombing. Production now is just above 30,000 tons per year, which is approximately equal to the new supply of concentrate now available.

Consumption of Tin by Product

Source: Tin, Lead and Zinc Div. —WPB in Long Tons

Item:	1942	1943	Jan.-June 1944
Tin and terneplate	29,404	22,643	11,851
Brass & bronze	27,655	28,839	17,597
Solder	13,924	13,098	6,593
Babbitt	6,099	7,381	4,448
Tinning	3,015	2,517	1,667
Collapsible tubes	1,099	602	256
Foil	576	371	200
Type metal	1,153	550	417
Chemicals	246	133	29
Pipe & tubing	161	117	103
Other and unclassified†	2,764	5,589	1,507
Total	86,096	81,840	44,668

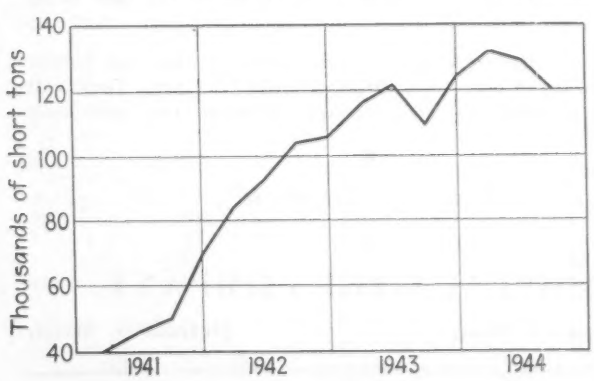
†Includes exports and re-exports of pig tin.

Brass Ingot Shipments Drop

• • • **Monthly shipments of brass** and bronze ingots have begun to drop off from the May high of 45,418 tons, according to a report of the Defense Council of the Ingot Brass and Bronze Industry which is said to represent more than 90 per cent of the industry. June, July and August deliveries varied between 40 and 41,000 lb., but September deliveries dropped to 38,333 lb. It is significant that this figure is not much below quarterly deliveries in 1941.

Some factors in the industry credit the drop in shipments to labor shortages both in the plants of the ingot producers and in the non-ferrous foundries. This is probably true to some extent but the principal cause is undoubtedly a desire to limit inventories in a market in which curtailment of orders is only a matter of time.

Red metal scrap, which has recently been weak although still selling at ceiling prices, has strengthened considerably this week. Supplies are adequate however.



DELIVERIES OF COPPER ALLOY INGOTS — *Quarterly Statistics from Defense Council of the Ingot Brass and Bronze Industry.*

British Limiting Copper

Toronto

• • • **Empire copper producers** have been notified that the British Government contracts for refined copper would not be renewed when they expire next year. Copper producers here will visit Britain this month to look into the situation. Canadian base metal mines have been closely associated with the war effort of the United Nations during the past five years. However, no shut-downs are expected and it is believed that production cut-backs will not be extreme. Canadian and Empire mines have been supplying copper to the United Kingdom at low prices. The deals made with copper and other base metal producers before the outbreak of war were the first effort to keep prices down, and they also had far reaching effect in the fixing of other prices during the war. Therefore Britain will probably wish to negotiate suitable terms of adjustment with the Canadian delegation to enable producers to market a reasonable output.

Canadian companies affected by the ruling are: International Nickel Co. of Canada Ltd., Noranda Mines Ltd., Hudson Bay Mining & Smelting Co., Waite Amulet Mines, Falconbridge Nickel Mines, Sherritt-Gordon Mines, and Normetal Mines. British contracts covered all Canadian refined copper production, less domestic requirements. British contracts for refined Canadian lead and zinc were renewed to September 1, 1945, and these still stand.

Primary Metals

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd.	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro. Conn. valley	12.00
Copper, electro. New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$4.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$108 to $110.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	8.50 to 9.00
Aluminum, deoxidizing Nos. 2, 3, 4	6.25 to 9.00
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	26.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ⅜ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ⅜ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (Phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys†

Briquetted Cartridge Brass Turnings	8.62½
Cartridge Brass Turnings, Loose	7.87½
Loose Yellow Brass Trimmings	7.87½

Aluminum

Plant scrap, segregated

2s solids	7.50
Dural alloys, solids 14, 17, 18, 24S	2.50
25S	3.00
turnings, dry basis	2.00
Low copper alloys 51, 52, 61, 63S solids	5.00
turnings, dry basis	3.00

Plant scrap, mixed

Solids	2.00
Turnings, dry basis	1.50

Obsolete scrap

Pure cable	7.50
Old sheet and utensils	4.00
Old castings and forgings	3.25
Pistons, free of struts	3.00
Pistons, with struts	1.50
Old alloy sheet	3.00

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

Zinc

New zinc clippings, trimmings	6.00
Engravers, lithographers plates	6.00
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.32-41.13
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

Firming Tendencies In Scrap Market Expected to Force Price Rise

Pittsburgh

• • • Reverberations of the recent 25,000-ton purchase of railroad heavy melting steel and No. 1 industrial scrap by the U. S. Steel Corp. are setting in. There have been some small sales of No. 1 heavy melting scrap at more than $16, but a price change is not yet substantiated. However, the bullishness of the market and dealers' resistance to low prices might force a change in the picture during the next few weeks. Another factor that will have a major influence on the price of scrap here is the increasing awareness that the war in Europe is not over and that the steel industry may be in for another winter's production of steel for war purposes. Scrap prices reflect steel operating rates and, if steel operations continue high prices will be pegged at a comparable level.

During the past several months steel producers, expecting a victory in Europe, have been inventory conscious. They have been trimming down their stocks of scrap and have been reluctant to do any buying except for replacement. This picture should change radically and steel producers may go back to heavy scrap buying. The immediate result would be a stronger price and a steadier flow of scrap. From the viewpoint of dealers and brokers, short sales should become even more risky than at present. Covering advance sales in a rising market inevitably is costly. Even now, dealers are finding that short sales are being fulfilled at prices at or above the sale price.

The strengthening of the market in the East was the direct result of the 25,000-ton sale made in Pittsburgh but filled with scrap from outside the district. While the filling of this order materially affected the eastern markets, its effect here was only to make dealers, brokers and consumers more aware of the stronger market. No tonnages of any size could be purchased here at present prices, a statement verified by an offer to four dealers by one large consumer to buy at $16. It was turned down. Furthermore, one dealer is known to be paying more for a specific grade of scrap than he is receiving for its sale.

The $4 spread between No. 1 railroad heavy melting and No. 2 heavy melting scrap here is unnatural but is representative of prices paid. This is caused by consumers who specify No. 1 industrial, in many cases even specifying the source. Much of what normally is No. 1 dealers' scrap is being classed as No. 2 and sold at the No. 2 price.

The availability of scrap here is not what it was a month ago. It is true that there is still considerably more offered than is being purchased, but the huge tonnages that were on the scrap offering lists a month ago have dropped sharply. On the whole, it looks like there might be a firming of prices within a short time.

CHICAGO — Scrap trading last week reflected unsettled conditions, and prices on certain items vary considerably from published ranges. Railroads still are attempting to maintain the $2 differential over No. 1 heavy melting steel which they enjoyed at the early stages of the current scrap price slippage. But major transactions make it appear that they are fighting a losing battle. No strength sufficient to greatly raise the current price level has yet appeared.

•

DETROIT—The scrap market gyrated here last week, then ended up on a duller note with quotations down from the highs. Turnings kept moving at levels moderately above last week's published grades but finally sagged notably, with machine shop turnings and mixed borings and turnings quoted this week off at least 50c. from last week. Heavy melting steel was selling near the top of the $11.50 to $12 range, there having been a few transactions above that level during the flurry last week.

•

ST. LOUIS—The scrap market is easier as the result of much freer offerings from all the South and Southwest as well as industrial and railroads here. Mills are said to have the largest inventories in several years, and are not expected to come into the market for the next thirty days. Railroad lists include Wabash, 1000 tons, and St. Louis-San Francisco, 36 carloads.

•

BOSTON—Some interests talk $11.50 a ton for strictly No. 1 steel, but no actual sales are reported at above $11, and little is moving at that price. Turnings and borings are a drug on the market. The commonly quoted price is $4 a ton, but there are no takers at that or any other price. Accumulations at yards are substantial. On the other hand, demand for foundry scrap far exceeds supply and prices hold at ceilings.

•

NEW YORK — While prices in this market remain unchanged, there is very little scrap moving as dealers are not making offerings. At current prices mills are taking all offerings. The end of the canal season is approaching and the increased cost of rail transportation will prevent subsequent shipments to Buffalo and other lake ports for the winter. Cast scrap grades remain at ceilings and supplies are exceedingly short.

•

PHILADELPHIA—There has been little change in the scrap market here this week. Although the larger dealers are holding back on shipments, the government surplus material which is going directly to the mills has taken up the slack. Sales of overseas battle scrap at Frederick, Va., during the past week brought $11.12 and $11.11 a ton for shoveling steel. High bidder was United Metal Co., Pittsburgh. Unprepared iron and steel scrap went to three bidders at $7.65, $7.21 and $7.16.

•

CLEVELAND — Railroad lists closed Nov. 8. While they brought more money, it did not classify a picture that is definitely confusing. Railroad scrap sold in Cleveland but was all moved outside that district. These sales gave the Buffalo district sympathetic strength. Until there is some buying the situation will remain indefinite but in the next two weeks it seems likely that almost all the mills in the district may be buying.

•

BUFFALO—Definite signs of improvement in the underpinning of the local scrap market are discerned by the trade in higher prices reported last week for railroad items. These include $18 for heavy melting; and settlement of the Republic steel strike. Business continues on a hand-to-mouth basis with the leading consumer still holding off, but dealer sentiment is looking up. Even machine shop turnings are showing indications of having hit bottom. Sales of low phosphorous scrap are reported to have been made at the government maximum and cast iron is as strong as ever at ceiling prices. Canal shipments of 2500 tons are scheduled to arrive this week and a lake cargo of 5000 tons is due from the Duluth-Superior district.

•

BIRMINGHAM—Mills are still out of the market in this area and very little demand exists for any type of material except cast iron. Some industrial scrap is moving to dealers' yards but not in any substantial quantity.

[Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4).]

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.50 to $16.00
RR. hvy. melt	17.50 to 18.00
No. 2 hvy. melting	14.00
RR. scrap rails	21.50
Rails 3 ft. and under	23.50
No. 1 comp'd sheets	15.50 to 16.00
Hand bdld. new shts.	15.50 to 16.00
Hvy. axle turn.	15.50 to 16.00
Hvy. steel forge turn.	15.50 to 16.00
Mach. shop turn.	9.50 to 10.00
Short shov. turn.	12.50 to 13.00
Mixed bor. and turn.	9.50 to 10.00
Cast iron borings	11.50 to 12.00
Hvy. break. cast	16.50 plus frt.
No. 1 cupola	20.00 plus frt.
RR. knuck. and coup.	21.50 to 22.00
RR. coil springs	21.50 to 22.00
Rail leaf springs	21.50 to 22.00
Rolled steel wheels	21.50 to 22.00
Low phos. billet crops	23.50 to 24.00
Low phos.	18.50 to 19.50
RR malleable	22.00 plus frt.

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.25 to $16.75
No. 2 hvy. melting	15.25 to 15.75
No. 1 bundles	15.25 to 15.75
No. 2 dealers' bndls.	14.25 to 14.75
Galv. bundles (No. 2)	12.25 to 12.75
Mach. shop turnings.	7.50 to 8.00
Short shoveling trngs.	8.00 to 8.50
Cast iron borings	8.00 to 8.50
Mix. bor. & short turn.	8.00 to 8.50
Low phos. hvy. forge	19.50 to 20.00
Low phos. plates	18.25 to 18.75
No. 1 RR hvy. mltng.	17.25 to 17.75
Reroll rails	22.25
Cut rails, 3 ft. and under	21.25 to 21.75
Locomotive tires, cut	18.75 to 19.25
Cut bolsters & side frames	18.25 to 18.75
Angles & splice bars.	20.25 to 20.75
No. 3 steel wheels	18.25 to 18.75
Couplers & knuckles.	19.00 to 19.50
Miscellaneous rails	19.25 to 19.75
Agricul. malleable	20.00 to 20.50
RR. malleable	21.00 to 21.50
St'dard stl. car axles	23.00 to 23.50
FOB shipping point	
No. 1 mach. cast	20.00
No. 1 agricul. cast	20.00
Cast iron car wheels	20.00
Hvy. breakable cast.	16.50
RR grate bars	15.25
Brake shoes	15.25
Stove plate	19.00
Clean auto cast	20.00

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to $15.50
No. 2 hvy. melting	14.00 to 14.50
No. 1 bundles	15.00 to 15.50
No. 2 bundles	13.00 to 13.50
Mach. shop turnings.	5.50 to 6.00
Shoveling turnings	7.00 to 7.50
Cast iron borings	7.50 to 8.00
Mixed bor. & turns.	6.00 to 6.50
No. 1 cupola cast	21.00
Hvy. breakable cast.	16.50
Low phos. plate	20.00 to 21.00
Scrap rails	20.00 to 21.00
Stove plate	15.50 to 16.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$11.00 to $11.25
No. 2 hvy. melting	9.75
Bundled skeleton	9.75
Turnings, shovelings	4.00
Turnings, regular	4.00
Mixed bor. & turns.	4.00
Mixed alloy turnings	4.00
Clean cast chem. bor.	13.06 to 14.15
Delivered to fdry. per gr. ton	
Breakable cast	21.57 to 21.87
Stove plate	20.00 to 23.51
Machinery cast, truck	21.00 to 23.51

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$11.50 to $12.00
No. 2 hvy. melting	11.50 to 12.00
No. 1 bundles	11.50 to 12.00
New busheling	11.50 to 12.00
Mach. shop turnings.	5.25 to 5.75
Short shov. turnings.	7.00 to 7.50
Cast iron borings	6.50 to 7.00
Mixed bor. & turns.	5.25 to 5.75
No. 1 cupola cast	19.00 to 20.00
Charging box cast	14.50 to 15.50
Hvy. breakable cast.	13.00 to 13.50
Stove plate	17.00 to 17.50
Flashings	11.50 to 12.00
Low phos. plate	14.00 to 15.00
Automotive cast	19.00 to 20.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.50
No. 2 hvy. melting	14.50
No. 2 bundles	13.50
Mach. shop turnings	9.50
Shoveling turnings	$12.00 to 13.00
Cast iron borings	10.50 to 11.00
Mixed bor. & turns.	9.50
No. 1 cupola cast	*20.00
Hvy. breakable cast.	*16.50
Cast, charging box	*19.00
Hvy. axle, forge turn.	16.00 to 16.25
Low phos. plate	18.25 to 18.75
Low phos. punchings	19.75 to 20.25
Billet crops	18.25 to 18.75
RR. steel wheels	19.00 to 19.50
RR. coil springs	19.00 to 19.50
RR. malleable	*22.00

*F.o.b. shipping point.

ST. LOUIS

Per gross ton delivered to consumer:

Hvy. melting	$16.00
No. 1 locomotive tires	$16.00 to 16.50
Misc. stand. sec. rails	17.00 to 17.50
Railroad springs	17.00 to 18.00
Bundled sheets	13.00 to 13.50
Heavy axle turnings	8.00 to 8.50
Machine shop turns.	6.50
Rerolling rails	21.00
Steel car axles	23.50
Steel rails under 3 ft.	21.50
Steel angle bars	18.00 to 18.50
Cast iron car wheels	20.00
No. 1 machinery cast	20.00
Railroad malleable	20.00 to 20.50
Breakable cast	16.50
Stove plate	17.00
Grate bars	15.25
Brake shoes	15.25

Note: Cast grades f.o.b. Shipping Point.

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to $15.00
No. 2 hvy. melting	13.50 to 14.00
No. 2 bundles	12.50 to 13.00
No. 1 busheling	11.50 to 12.00
Scrap rails	14.00 to 14.50
Rails for rerolling	17.00 to 17.50
Rails 3 ft. & under	17.00 to 17.50
Angles & splice bars.	16.50 to 17.00
Long turnings	4.50 to 5.00
Cast iron borings	6.50 to 7.00
Steel axles	14.50 to 15.00
Stove plate	16.50 to 17.00
Bar crops and plate.	16.00 to 16.50
Structural and plate.	16.00 to 16.50
No. 1 cast	20.00 to 21.00
Cast iron carwheels	13.00 to 13.50

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.00 to $16.50
No. 2 hvy. melting	16.00 to 16.50
Low phos. plate	19.00 to 19.50
No. 1 busheling	16.00 to 16.50
Hydraulic bundles	16.00 to 16.50
Mach. shop turnings.	9.00 to 9.50
Short shovel. trngs.	11.00 to 11.50
Cast iron borings	10.00 to 10.50

NEW YORK

Dealers' buying prices, per gross ton, on cars:

No. 1 hvy. melting	$11.00 to $11.50
No. 2 hvy. melting	10.00 to 10.50
Hyd. comp. black bundles	9.00 to 9.50
Hyd. comp. galv. bundles	7.00 to 7.50
Hvy. breakable cast.	16.50
Charging box cast	19.00
No. 1 cupola cast	20.00
Clean auto cast	20.00
Unstrip. motor blks.	17.50
Stove plate	19.00
Clean chem. cast bor.	14.33
Mach. shop turnings.	5.00 to 5.50
Mixed bor. & turns.	5.00 to 5.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.50 to $17.00
No. 1 bundles	15.00 to 15.50
No. 2 bundles	14.00 to 14.50
No. 2 hvy. melting	15.00 to 15.50
Mach. shop turnings	8.50 to 9.00
Shoveling turnings	11.00 to 11.50
Cast iron borings	10.00 to 10.50
Mixed bor. & turns.	10.00 to 10.50
No. 1 cupola cast	20.80 to 22.50
Stove plate	19.50 to 21.50
Low phos. plate	21.75
Scrap rails	19.00 to 19.25
Rails 3 ft. & under	22.75
RR steel wheels	23.75
Cast iron car wheels	20.00
RR coil & leaf sprgs.	23.75
RR knuckles & coup.	23.75
RR malleable	22.00
No. 1 busheling	15.50 to 16.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to $15.50
No. 2 hvy. melting	15.00 to 15.50
Compressed sheet stl.	15.00 to 15.50
Drop forge flashings	15.00 to 15.50
No. 2 bundles	14.50 to 15.00
Mach. shop turnings.	6.00 to 6.50
Short shovel. trngs.	10.00 to 11.00
No. 1 busheling	14.50 to 15.00
Steel axle turnings	14.50 to 15.00
Low phos. billet and bloom crops	20.00 to 21.00
Cast iron borings	10.00 to 11.00
Mixed bor. & turns.	9.50 to 10.50
No. 2 busheling	13.00 to 13.50
No. 1 machine cast	20.00 plus frt.
Railroad cast	20.00 plus frt.
Railroad grate bars	15.25
Stove plate	19.00 plus frt.
RR. hvy. melting	17.50 to 18.00
Rails 3 ft. & under	23.00 to 23.50
Rails 18 in. & under	24.25 to 24.75
Rails for rerolling	23.00 to 23.50
Railroad malleable	22.00 plus frt.
Elec. furnace punch.	18.00 to 19.00

SAN FRANCISCO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.00 to $16.75
RR hvy. melting	16.00 to 16.75
No. 2 hvy. melting	15.00 to 15.75
No. 2 bales	14.00 to 14.75
No. 3 bales	10.00 to 10.75
Mach. shop turnings.	7.00
Elec. furn. 1 ft., under	16.00 to 17.50
No. 1 cupola cast	20.00 to 22.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to $16.00
No. 2 hvy. melting	14.00 to 15.00
No. 2 bales	13.00 to 14.00
No. 3 bales	10.00 to 10.50
Mach. shop turnings.	5.00
No. 1 cupola cast	20.00 plus frt.

SEATTLE

Per gross ton delivered to consumer:

No. 1 hvy. melting	$13.50
RR hvy. melting	13.50
No. 3 bundles	11.50
Elec. furn. 1 ft., und.	$16.00 to 17.00
No. 1 cupola cast	20.00 plus frt.

Comparison of Prices . . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. (Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	Nov. 7, 1944	Oct. 31, 1944	Oct. 3, 1944	Nov. 9, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Nov. 7, 1944	Oct. 31, 1944	Oct. 3, 1944	Nov. 9, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh	$15.75	$15.75	$16.25	$20.00
Heavy melt'g steel, Phila.	15.50	15.00	14.50	18.75
Heavy melt'g steel, Ch'go	16.50	16.50	17.50	18.75
No. 1 hy. comp. sheet, Det.	11.75	11.75	11.75	17.85
Low phos. plate, Youngs'n	17.75	17.75	19.00	22.50
No. 1 cast, Pittsburgh	20.00*	20.00*	21.50	20.00
No. 1 cast, Philadelphia	20.00*	20.00*	22.75	20.00
No. 1 cast, Chicago	20.00*	20.00*	22.17	20.00

*F.o.b. shipping point.

Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 159-167.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
November 7, 1944	2.25513c. a Lb.	23.61 a Gross Ton	$15.92 a Gross Ton
One week ago	2.25513c. a Lb.	23.61 a Gross Ton	$15.75 a Gross Ton
One month ago	2.25513c. a Lb.	23.61 a Gross Ton	$16.08 a Gross Ton
One year ago	2.26190c. a Lb.	23.61 a Gross Ton	$19.17 a Gross Ton

	HIGH	LOW	HIGH	LOW	LOW	HIGH
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$19.17, Apr. 10	$22.00, Jan. 7
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	16.04, Apr. 9	21.83, Dec. 30
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	14.08, May 16	22.50, Oct. 3
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	11.00, June 7	15.00, Nov. 22
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	12.67, June 8	21.92, Mar. 30
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	12.67, June 9	17.75, Dec. 21
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	10.33, Apr. 29	13.42, Dec. 10
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	9.50, Sept. 25	13.00, Mar. 13
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	6.75, Jan. 3	12.25, Aug. 8
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	6.43, July 5	8.50, Jan. 12
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	8.50, Dec. 29	11.33, Jan. 6
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	11.25, Dec. 9	15.00, Feb. 18
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	14.08, Dec. 3	17.58, Jan. 29

Weighted index based on steel bars, beams, tank plates, wire rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Finished Iron and Steel Prices . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Provo, Utah	[10] Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)						2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)						3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10						5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60							
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75							
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢		2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢		2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢		2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢		c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)			(Toledo = 2.80¢)			2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massilon, Canton = 2.70¢)						2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.60¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢		4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢		4.15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢			2.45¢		2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)									
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)									
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)									
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)									
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)				3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)						3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47; Pgh. Steel Co. (reroll) $38.25, (forging) $44.25. Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth.

Sheet bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill. Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2 $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich. Geneva Steel Co. $58.64 f.o.b. Pac. C. Pgh. Steel Co. $43.50.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron and Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. $2.75 f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel Corp., Benwood, $2.05 per cwt.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago, base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	3.518	4.872[8]	5.018a	3.922	4.772	3.605	3.666	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.958	7.058	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.65[917]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257[4]	3.86	4.351[7]	3.811[3]	3.811[3]	3.761[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	8.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.829	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	[5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

MILL EXTRAS FOR NATIONAL EMERGENCY STEELS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 1330	0.10¢	$2.00	....	.....	NE 9415	0.75¢	$15.00	$1.25	$25.00
NE 1335	0.10	2.00	....	.....	NE 9417	0.75	15.00	1.25	25.00
NE 1340	0.10	2.00	....	.....	NE 9420	0.75	15.00	1.25	25.00
NE 1345	0.10	2.00	....	.....	NE 9422	0.75	15.00	1.25	25.00
NE 1350	0.10	2.00	....	.....	NE 9425	0.75	15.00	1.25	25.00
					NE 9427	0.75	15.00	1.25	25.00
					NE 9430	0.75	15.00	1.25	25.00
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8625	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8627	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00					
NE 8635	0.65	13.00	1.15	23.00					
NE 8637	0.65	13.00	1.15	23.00	NE 9722	0.65¢	$13.00	$1.15	$23.00
NE 8640	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8642	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9742	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9745	0.65	13.00	1.15	23.00
					NE 9747	0.65	13.00	1.15	23.00
					NE 9750	0.65	13.00	1.15	23.00
NE 8712	0.70¢	$14.00	$1.20	$24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00					
NE 8720	0.70	14.00	1.20	24.00					
NE 8722	0.70	14.00	1.20	24.00	NE 9830	$1.30	$26.00	$1.80	$36.00
NE 8725	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8727	0.70	14.00	1.20	24.00	NE 9935	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00					
NE 8747	0.70	14.00	1.20	24.00					
NE 8750	0.70	14.00	1.20	24.00	NE 9912	$1.20	$24.00	$1.55	$31.00
					NE 9915	1.20	24.00	1.55	31.00
					NE 9917	1.20	24.00	1.55	31.00
NE 9255	0.40¢	$8.00	....	.....	NE 9920	1.20	24.00	1.55	31.00
NE 9260	0.40	8.00	....	.....	NE 9922	1.20	24.00	1.55	31.00
NE 9261	0.65	13.00	....	.....	NE 9925	1.20	24.00	1.55	31.00
NE 9262	0.65	13.00	....	.....					
					NE 52100A	....	.....	$2.60	$52.00
					NE 52100B	....	.....	2.60	52.00
					NE 52100C	....	.....	2.60	52.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip, and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton $54.00
Price delivered Detroit $2.00 higher; E. Michigan, $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.
Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

JOMAC

HEAT-RESISTING GLOVES

(and Long-Wearing, too!)

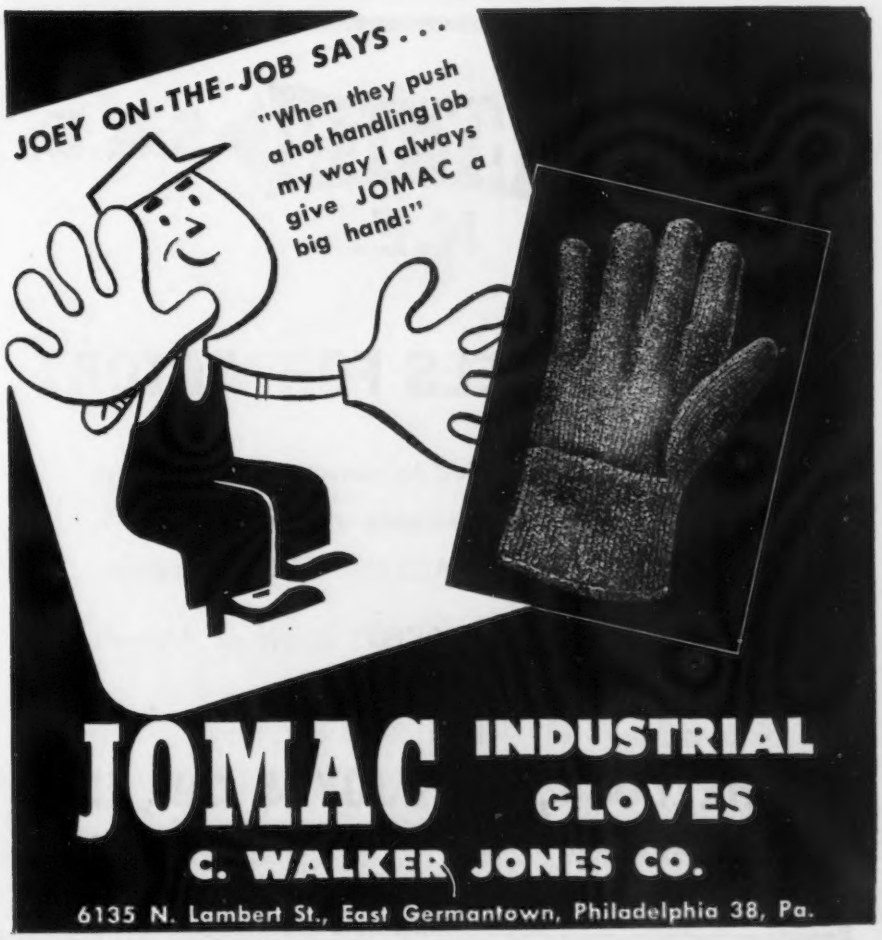
A special pile-knitting machine is used to achieve the remarkable Jomac Fabric which is helping to lick the many hot and heavy jobs in America's busy shops and foundries. This fabric is a loop-finished cloth that is thick with air-cells which dissipate heat. Jomac's "cushion" loops give added life and wear . . . allow breathing-space . . . make a sturdy, protective glove that allows constant handling of metals too warm to touch.

Jomac Gloves are *washable*, too. They can be laundered repeatedly, *kept clean* . . . and thus minimize the dangers of dermatitis and other skin infections.

(Jomac also makes the Regular Work Gloves—these are semi-heat-resisting.)

TEST THEM!

Just try JOMAC GLOVES on your stiffest jobs. Test them for heat-resistance, for wear, for washability, for economy, for *increased production*. Write for full details.



JOMAC INDUSTRIAL GLOVES

C. WALKER JONES CO.

6135 N. Lambert St., East Germantown, Philadelphia 38, Pa.

MACHINED BRONZE BEARINGS
GRAPHITED AND OILLESS
BRONZE BEARINGS
BRONZE GEAR BLANKS
MACHINED BRONZE PARTS

S & H Bronze Bearings are made of cast bronze, under the most modern conditions and of specifications to meet the most exacting requirements. We are manufacturers of plain bronze and graphited and oilless bronze bearings for all branches of the Government Services, as well as plain cylinder type, single and double flange, thrust washers, from 3/8" in diameter to 20" in diameter. We also manufacture special parts made of cast bronze. Our manufacturing methods and equipment enable us to meet the most exacting machining specifications.

If it's Bronze BETTER B BEARINGS *We make it*

INDUSTRIAL BEARINGS

S. & H. Bearing and Manufacturing Co.
340-344 North Avenue, East
Cranford New Jersey

A.I.S.I. HY-TEN S.A.E. N.E.

ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

WHEELOCK, LOVEJOY & CO., INC.
126 Sidney Street Cambridge 39, Mass.
Cleveland 14, Chicago 23, Newark 5, Detroit 3, Buffalo 10, Cincinnati 32

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 8 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	*Seamless Hot Rolled*	*Lap Weld, Hot Rolled*
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	....
	Base per 100 lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	.67	.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
⅝ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

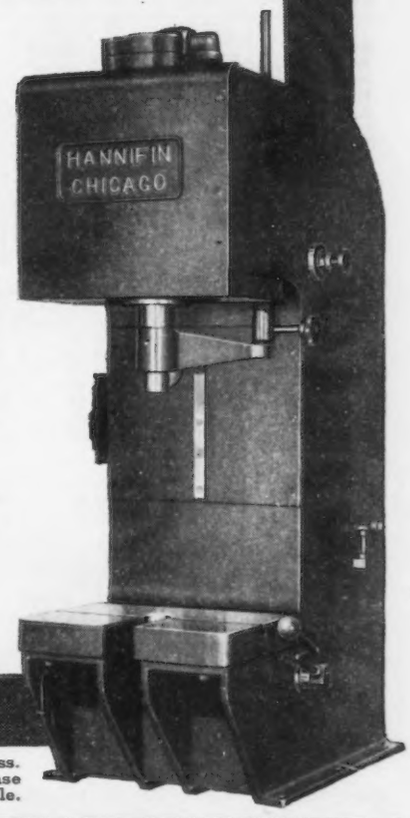
	20x14 in	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20 lb. coating I.C.	7.50	15.00

Bench type 5 ton Hydraulic Press

A compact, self-contained unit designed to handle many straightening, pressing, forming, and broaching operations.

Rapid and accurate work on a variety of operations is assured with this compact 5 ton hydraulic press. Single lever control is simple and easy to handle and allows the operator to maintain rapid action without fatigue. Ram stroke is 10 inches, and both maximum pressure and ram stroke are adjustable. The motor driven hydraulic power unit is built in. Installation requires only electrical connections. Write for complete data.

HANNIFIN
621-631 South Kolmar Avenue
Chicago 24, Illinois



5 ton bench type hydraulic press. Floor type with welded steel subbase and other capacities also available.

"HERCULES" REG. U.S. PAT. OFF. RED-STRAND WIRE ROPE

You Can Depend On "Hercules" (Red Strand) Wire Rope

Highlights of Quality

1. Acid Open-Hearth Steel Wire
2. Rigid Tests and Inspections
3. Correct Manufacturing Methods
4. Furnished in both the Round and Flattened Strand constructions, in either Standard or Preformed Type.

• • Results are what count, and the performance record of this wire rope continues to make and hold friends.

There is no guess work when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. If you will tell us how you use wire rope, we shall be glad to suggest the construction and type most suitable for your conditions.

MADE ONLY BY
A. LESCHEN & SONS ROPE CO.
WIRE ROPE MAKERS — ESTABLISHED 1857
5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK • • • 90 West Street
CHICAGO • • 810 W. Washington Blvd.
DENVER • • • 1554 Wazee Street
SAN FRANCISCO • • 520 Fourth Street
PORTLAND • • 914 N. W. 14th Avenue
SEATTLE • • 3410 First Avenue South

PIG IRON

All prices set in bold face type are maximum established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	ow Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	$29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn., fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	26.13	*27.1*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron & Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorus iron; high phosphorus sells for $28.50 at the furnace.

(3) E. & G. Brooke Co., Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh,	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges.

"Plus or Minus...."

Those "tolerance" boys with the devilish micrometers sometimes want springs made to tight measurements...we just smile...and make them...but it adds plenty of "plus" to the cost. Lots of springs aren't so fussy...just good quality and easy tolerances...we make them, too...for less. We'll tackle your jobs-either kind-and try to give satisfaction because we want to be

"Everybody's Spring Dept."

DUNBAR
BROTHERS CO.
DIV. OF ASSOCIATED SPRING CORP.
BRISTOL, CONN.

SPRINGS · WIRE FORMS · SMALL STAMPINGS

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Sec. quality, New Jersey	51.00
No. 1 Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00

Chrome Brick

	Per Net ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70

(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plate, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

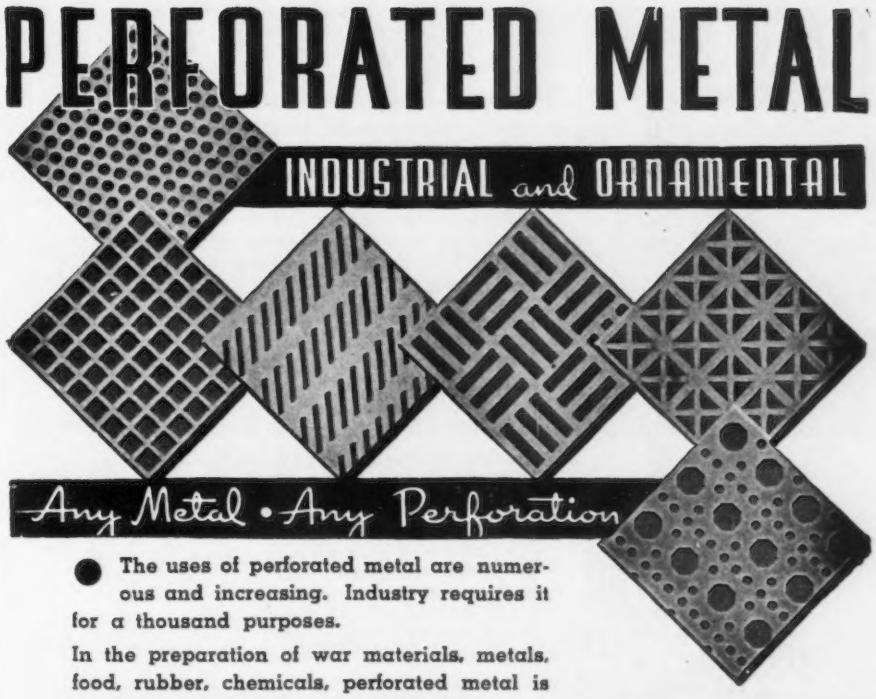
ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PERFORATED METAL

INDUSTRIAL and ORNAMENTAL



● The uses of perforated metal are numerous and increasing. Industry requires it for a thousand purposes.

In the preparation of war materials, metals, food, rubber, chemicals, perforated metal is required to perform an important role.

The Harrington & King PERFORATING Co.

5657 FILLMORE STREET—CHICAGO 44, ILL.
Eastern Office, 114 Liberty Street, New York 6, N. Y.

Use *Top Quality* CLEVELAND CAP SCREWS to maintain your best assembly speed

CLEVELAND *Top Quality* FASTENERS

The Cleveland Cap Screw Company

2929 EAST 79TH STREET • CLEVELAND 4, OHIO

Warehouses: Chicago, Philadelphia, New York, Los Angeles

MADE BY THE ORIGINATORS OF THE KAUFMAN PROCESS FOR GREATER STRENGTH AND ACCURACY

NO heavyweight is needed to lift these 10 tons—just an average 160 lb. man can do it easily and quickly with a Reading Multiple Gear Hoist. Spur gears, running in a bath of oil, are contained in a dust-proof and oil-tight housing making it one of the easiest hoists to operate. And long life and great efficiency are insured whether it is used indoors or out.

The hoisting mechanism is made of steel from "hook to hook" and range in size from 1/2 to 30 ton capacity. Regardless of load, a positive acting brake permits the load to be stopped in mid-air without danger of slipping back or falling.

Reading Multiple Gear Hoists have been relieving the manpower shortage in many industries by handling heavy loads surely, rapidly, and accurately. Write for complete information and engineering data for help in saving man-hours and boosting output.

READING CHAIN & BLOCK CORPORATION
2101 ADAMS ST., READING, PA.

CHAIN HOISTS • ELECTRIC HOISTS • OVERHEAD TRAVELING CRANES

READING HOISTS

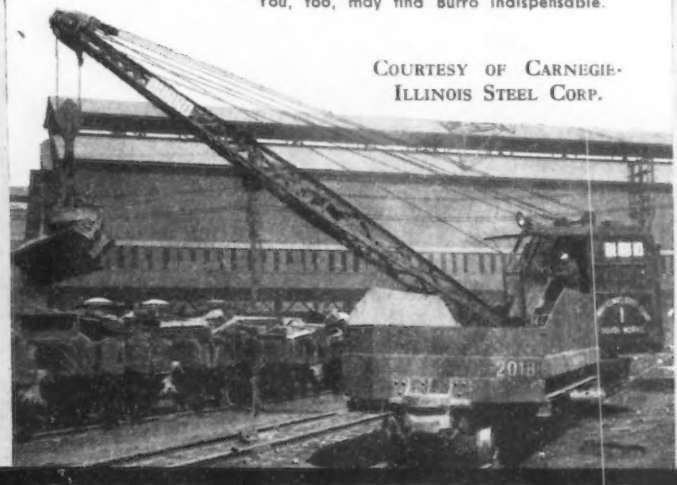
A "BURRO" FOR WORK

For any job of loading, unloading, handling, excavating, building, hauling or dismantling, the BURRO Crane is really a "Burro" when it comes to doing the job better, cheaper, easier and faster. Name your job and the chances are that Burro can save you time and money, too.

Short tail-swing . . . Independent clutches for each operation . . . Drawbar pull up to 7500 lbs. . . . speeds up to 27 m.p.h. . . . Elevated boom heels . . . low over-all height . . . sets itself off and on track . . . equipped with fittings for using buckets, magnets, etc. . . . Does its own hauling, switching.

Operators like the Burro because it handles easily. Everyone likes it because it can do so many kinds of work efficiently and economically.

Write for bulletins F-115 and F-120.
You, too, may find Burro indispensable.



COURTESY OF CARNEGIE-ILLINOIS STEEL CORP.

CULLEN-FRIESTEDT CO.
1303 S. Kilbourn Ave., Chicago 23, U.S.A.

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(C/L, Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more.... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.
- Open hearth $2.70
- Crucible $2.80
- Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5..... $1.10

Ferroboron, contract basis, 17.50% min., Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.
- 2000 lb. to carload..... $1.20
- Under 2000 lb..... 1.30

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
- Carload lots ..... 25c.
- 2000 lb. to carload..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
- Carload lots ..... 58c.
- 2000 lb. to carload..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
- No. 1 ..... 87.5c.
- No. 6 ..... 60c.
- No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
- Ton lots, per lb..... 45c.
- Less ton lots, per lb..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
- 2000 lb. lots..... $2.25
- Under 2000 lb. lots..... $2.30

Ferrotitanium, 40%-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
- Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10%C. max., ton lots, per lb. contained titanium $1.35
- Less ton lots..... $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload..... $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton..... $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo..... 80c.

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo..... 80c.

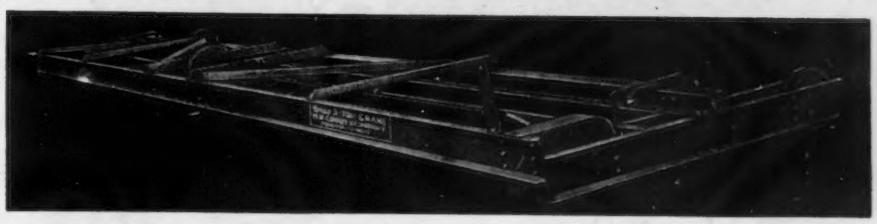
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
- Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy
- Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
- Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
- Car lots ..... 8.75c.
- Ton lots ..... 9.25c.

CONCO 3-Motor Single Girder CAB OR FLOOR OPERATED ELECTRIC CRANE . . .



● **Available in capacities of one through five tons for floor or cab operation. Simply, ruggedly designed for low first cost and maintenance. Used with Low Headroom Type Hoist, provides for maximum space coverage horizontally and vertically. Effective in even a minimum space. Write for Bulletin 2000.**

Write for Bulletin 26000 describing the Torpedo Hoist shown. Three capacities 250 lb. — $139.50, 500 lb. — $149.50, 1000 lb. — $159.50. Heavily, simply built, with Push Button Control. Outstanding in CONCO'S complete line of hand-powered and electric Cranes, Hoists, Trolleys.

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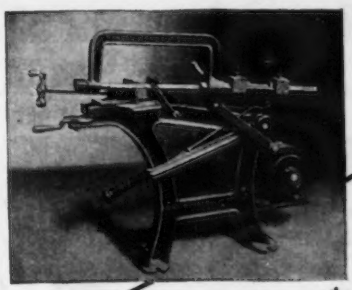
Builders Of Conco Torpedo Electric Hoist



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No. 1 Draw Cut Hack Saw Dry cut, 4" x 4" capacity. A sturdy saw well-known for its dependability, economy, and invaluable service in the small shop or shop department. Simple and efficient with low original, maintenance, and blade cost.

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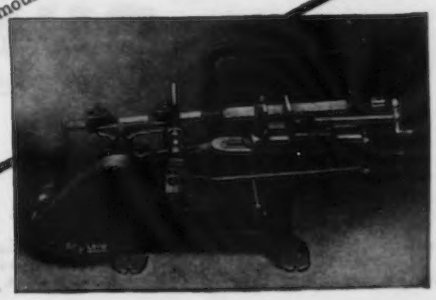
No. 2 Draw Cut Hack Saw. Companion to the No. 1 but with a normal 6" x 6" capacity which can be increased to 8" x 8" by shortening the stroke with adjustable crank. The No. 2 MARVEL also has a swivel vise which is removable from the "T" slotted bed, permitting special fixtures to be mounted. Both machines are available in belt and motor driven models. Motor driven models can also be furnished mounted on portable truck.



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Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course)

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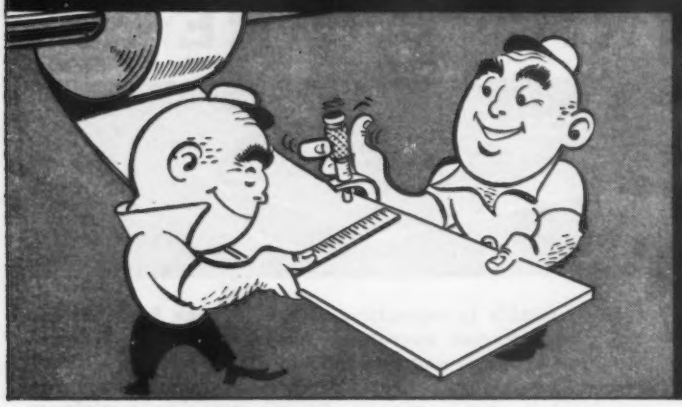
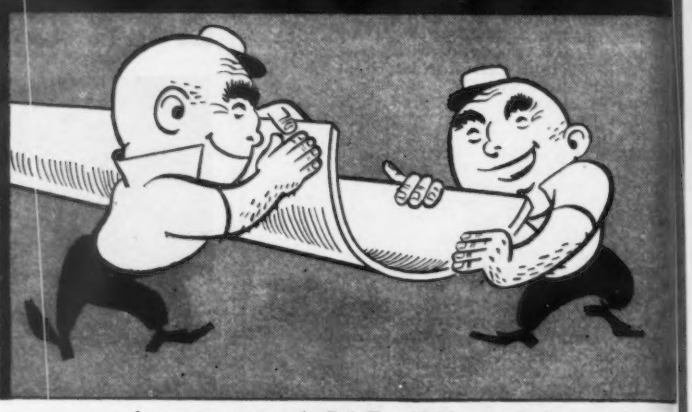
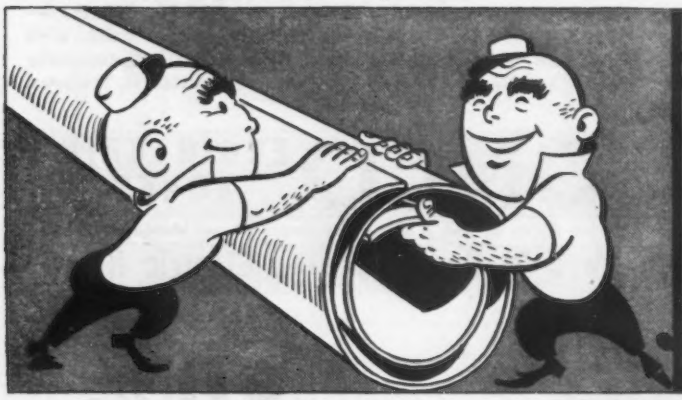
NO SECRET ABOUT BUNDYWELD



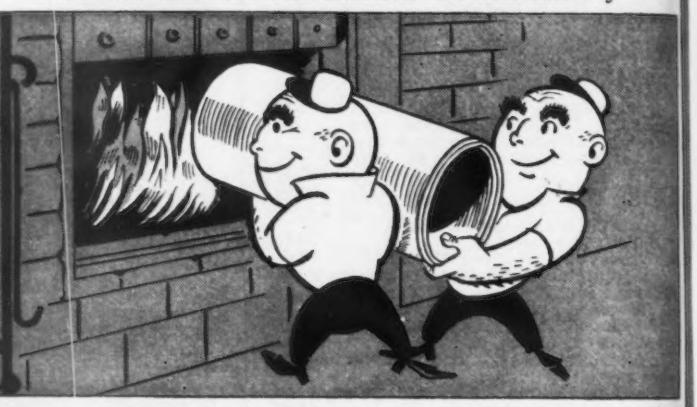
1 Bundyweld Steel Tubing is made by a process entirely different from that used in the making of any other tubing. A single strip —



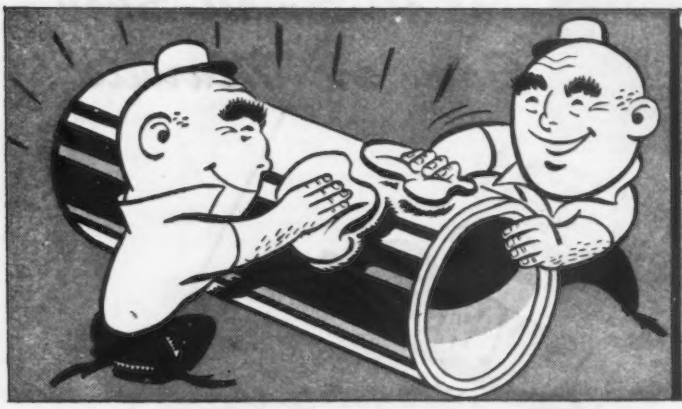
2 — of copper-coated S.A.E. 1010 steel is *continuously* rolled twice around *laterally* into tubular form. Walls of uniform thickness and concentricity —



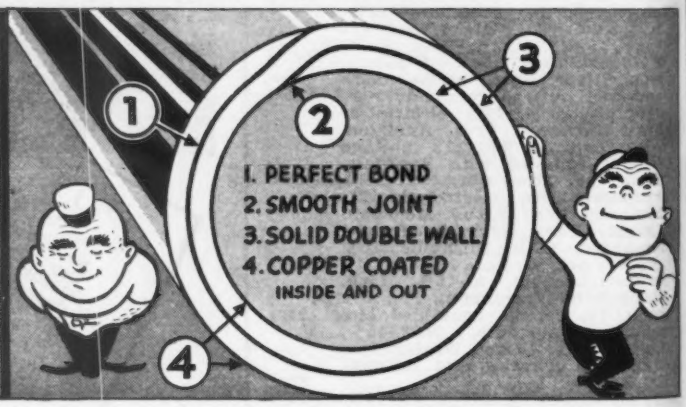
3 — are assured by the use of close tolerance cold rolled strip. This double rolled strip in tubular form is —



4 — next passed through a brazing furnace where it is brazed and cooled in a reducing atmosphere. After brazing the tube has become —



5 — a SOLID double wall steel tube completely copper brazed throughout 360° of wall contact, copper coated inside and out, free from scale and closely held to dimensions. It is —



6 — furnisned hard or annealed in a wide range of standard diameters and gauges up to 5/8" O.D. Special sizes, cold drawn as desired. Also furnished in Monel.

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